



**UNIVERSITY OF GOTHENBURG**  
**SCHOOL OF BUSINESS, ECONOMICS AND LAW**

**Sustainability within the Swedish automotive  
industry**

*A qualitative study of the incorporation of sustainability criteria in the  
decision-making process*

Erik Enström & Olle Fren din

Graduate School

Spring 2023 Master Degree Project in Innovation and Industrial Management

Supervisor: Hani Elzoumor

## **Abstract**

An increasing amount of pressure has been seen from stakeholders that companies should transition their business to become more sustainable. The result of this pressure can be seen in the Swedish automotive industry as the largest companies have all committed to ambitious sustainability goals. The purpose of this study was to explore how the Swedish automotive industry has incorporated sustainability criteria in the decision-making process. The literature review covered the concept of sustainability through the triple bottom line, long-term planning methods, and some decision-making methods that include multiple criteria. To receive an in-depth understanding of this, a qualitative study was conducted with an exploratory approach. The primary data collection was gathered through eight semi-structured interviews, and along with the secondary data it was contrasted with the literature. The findings suggest that as the economic criterion has always been prioritized in decision-making, the environmental criterion has caught up and is now arguably as important as the economic one. The findings also suggest that the social criterion is viewed as a management subject, and that little attention is given to it on a functional level. As the industry is facing many challenges, the results indicate that scenario planning is an important tool for decision-makers' ability to plan for a sustainable future. Lastly, the main barriers identified were the difficulty in measuring and collecting qualitative sustainability criteria, and ensuring the incorporation of sustainability criteria across the entire value chain with limited insight.

**Keywords:** Decision-making, Sustainability criteria, Automotive industry, Multi-criteria decision analysis, Scenario Planning.

# Table of Contents

<b>1.0 Introduction</b>	<b>6</b>
1.1 Background	6
1.2 Problem discussion	8
1.3 Purpose and research questions	8
1.4 Delimitations	9
1.5 Disposition	10
<b>2.0 Literature review</b>	<b>11</b>
2.1 Theories and previous literature on the fields	11
2.2 Triple Bottom Line	12
2.3 Scenario planning for corporate foresight	14
2.3.1 Mitigating uncertainty through planning	17
2.4 Sustainability-measures impact on financial performance	19
2.5 Life cycle assessment	20
2.6 Decision theory	21
2.7 Decision-making methods	22
2.7.1 Multi-criteria decision-making	22
2.7.2 Multi-attribute Value theory	24
2.7.3 Analytical Hierarchy Process	24
2.7.4 Fuzzy Analytical Hierarchy Process	27
2.7.5 Criteria used in previous studies	28
2.8 Main take-aways from the literature review	29
<b>3.0 Methodology</b>	<b>30</b>
3.1 Research Strategy	30
3.1.1 Limitations of qualitative research	31
3.2 Research design	32
3.3 Data Collection	33
3.3.1 Primary data collection	33
3.3.1.1 Interview design	34
3.3.1.2 Selection of Participants	34
3.3.1.3 Interview setting	36
3.3.2 Secondary data collection	37
3.4 Literature review	38
3.5 Data analysis	39
3.6 Research quality	40
<b>4.0 Empirics</b>	<b>42</b>
4.1 Sustainability goals	42

4.1.1	Volvo Cars sustainability goals and recent investments	42
4.1.2	Polestar sustainability goals and recent investments	43
4.1.3	Lynk & Co sustainability goals and recent investments	43
4.2	TBL	43
4.2.1	How the three criteria are considered in the companies	43
4.2.2	How regulations and other external factors have affected the companies' commitment	45
4.3	Scenario Planning	46
4.3.1	The use of Scenario Planning	46
4.3.2	The impact of uncertainty	48
4.4	Decision-methods	49
4.4.1	Evaluating alternatives	49
4.4.2	Criteria considered by the companies	51
4.4.3	Qualitative data and its challenges	54
4.4.4	Barriers to incorporate the sustainability criteria	55
<b>5.0</b>	<b>Analysis</b>	<b>56</b>
5.1	The inclusion of sustainability criteria into the decision-making, and the differences between functions	59
5.1.1	How sustainability is viewed	59
5.1.2	Decision Methods	61
5.1.3	Decision-making based on criteria	62
5.1.4	Criteria prioritized by companies	63
5.2	The most prominent challenges when considering sustainability in the decision-making process	65
5.2.1	Qualitative data and challenges	65
5.3	The use of corporate foresight	66
5.3.1	Facilitate decision-making through scenario planning	66
5.3.2	Uncertainty as a driving factor	69
<b>6.0</b>	<b>Conclusion</b>	<b>71</b>
6.1	Answering the research questions	72
6.2	Implications	73
6.3	Future research	74
	<b>References</b>	<b>76</b>
	<b>Appendix 1</b>	<b>84</b>
	<b>Appendix 2</b>	<b>87</b>

## **Acknowledgement**

We would like to extend our heartfelt appreciation and gratitude to our supervisor, Mr. Hani Elzoumor, for his guidance and support throughout the completion of this master thesis. Mr. Elzoumor's experience and knowledge have been of great value in shaping the direction and quality of this research. His insightful feedback and meticulous attention to detail have greatly enriched this thesis.

We would also like to express our sincere gratitude to the participants in this study. Their willingness to share their experiences and insights during the interviews was crucial to the success of this research. Their valuable input has provided important perspectives to this field of study.

We are truly grateful for the opportunity to work with such an exceptional supervisor and to have had the privilege of engaging with insightful participants. Thank you all for your contributions and support throughout this journey.

## **1.0 Introduction**

*The first chapter will introduce the background of the topic and the research problem identified. It begins with an introduction of the background and the problem discussion, it is then followed by the research purpose and the research questions of the thesis. The final two sub-chapters present the delimitations and the disposition of the thesis.*

### **1.1 Background**

The evolving and changing perception of how and what is expected of automotive companies from a sustainability perspective, such as the environmental footprint, their social impact and transparency has increased the number of criteria that have to be considered when decisions are made. As new technologies emerge and new standards arise, the continuous change challenges companies' ability to forecast what the next move is, yet increases the need for it (Pohl, 2021). The traditional manufacturing of automobiles have paid little attention to sustainability (Pohl, 2021), however, as the economic conditions has improved in emerging countries, e.g. India, global warming and resource depletion have become a result of the increasing demand of automobiles, thus increasing the attention to sustainability alongside other factors in the industry (Mathiyazhagan et al., 2018).

Despite the disruptions that have shaken supply chains for many industries, the automotive industry faces both internal and external pressure to comply with regulations, stakeholders, employees, and consumers' demands regarding the company's responsibility in working for a sustainable future (Pohl, 2021). Naturally, more factors must be taken into account if the manufacturers are to apply new and more criteria in their decision-making. As sustainability has gained much attention, companies are now also re-evaluating their existing investments and operations to ensure that they meet common goals such as the Paris Agreement, internal pressure, and new demands from stakeholders (Pohl, 2021).

Lately, the academic literature has come to agree that there is a correlation between a company's financial performance and its environmental, social, and governance (ESG) commitment (Daugaard, 2020; Friede et al., 2015). The evolving interconnection has changed the engagement necessary for firms to both gain and remain competitive. The stakeholders

have become a great source of power and their impact on business success has led firms to increase their commitment to establishing close relationships with their stakeholders (Hack, 2011). In more recent years, organizations have increased their awareness and commitment to mitigate their own and their value chains' carbon footprint. Thus, social, environmental, and economic issues have gained attention (Elkington, 1997).

As the automotive industry is argued to be one of the industries that will undergo one of the greater transformations (Vecchiato et al., 2019), its efforts to become sustainable are arguably not driven by one thing. Several drivers are accelerating the trend, combining among other things stricter regulations on emissions and an increased awareness of their impact on society (PWC, 2023). Other trends are also indicating that the industry is facing and undergoing change that forces companies within the automotive industry to add new criteria in their decision-making. Listed by OECD (2016), megatrends such as natural resources and energy, climate change and environment, and society are expected to drive and impact the next two decades' innovation and research. Thus, a great emphasis on similar themes can be expected in the automotive industry, and the importance of planning for such scenarios has increased.

The estimated number of produced vehicles over the past years has fluctuated, though it has still been well above 80 million excluding the year 2020 due to the outbreak of Covid-19 (Statista, 2022). Transportation is responsible for a great part of the total greenhouse gas (GHG) emissions globally. In 2020, 27 percent of the U.S. GHG emission came from the transportation sector (EPA, 2022), while Sweden, the year after, saw its transportation sector be responsible for 31 percent of the country's GHG emission, where passenger cars accounted for over 60 percent of it, i.e., around one-fifth of Sweden's GHG emission comes from passenger cars (Naturvårdsverket, 2023). Further, approximately 10 percent of the total emission from a car is estimated to come from its production (Campbell, 2022), leaving a country like Sweden, where the automotive industry accounts for the largest group of export goods as it plays a major role in both economic and labor terms, exposed to many challenges while tackling the joint mission of mitigating the carbon emissions (SCB, 2022; ITA, 2022).

Approximately 140,000 people are employed within the automotive industry in Sweden, where the highest concentration is on the West-coast, representing 40,000 of the employees mainly due to the location of the production plant of Volvo (ITA, 2022). The obvious importance of this industry for the Swedish economy amplifies the importance and stresses the need of transforming it to become more sustainable. If joint goals such as the Paris Agreement shall be achieved, Sweden's largest export category must adapt to both innovations, legislation, and objectives. Its importance for both the economy and labor market is hence of great interest to study - how does the industry consider sustainability criteria in their decision-making process?

## **1.2 Problem discussion**

Many companies in the automotive industry are often vocal about their sustainability goals. However, it can be difficult to incorporate sustainability goals due to conflicting criteria that need to be considered, such as economic, environmental, and social (Elkington, 1997). While companies recognize the importance of sustainability, the economic criterion is usually prioritized over the other criteria during the decision-making process because of the nature of a business. This is particularly challenging as stakeholders' interests may conflict with the interest of the organization, and incorporating specific interests can be challenging (Brunsson, 1982). Furthermore, the decision-making process is complicated by a large number of criteria, making it challenging for companies to select the most suitable alternative. The choice of criteria has a significant impact on how the company evaluates different alternatives, thus it is crucial to have a comprehensive method to address this. To reach their sustainability goals it is important to have the right pieces in place and it is therefore important to have a decision-making method that can incorporate conflicting criteria to aid the decision-makers.

## **1.3 Purpose and research questions**

This thesis aims to explore how sustainability criteria influence the decision-making process within Swedish automotive companies. The thesis also aims to examine the possible barriers they have to overcome. Furthermore, the thesis seeks to investigate how Swedish automotive companies use corporate foresight to ease decision-making and enable more informed and sustainability-oriented decisions. By analyzing how companies structure their



decision-making, this thesis seeks to add to the literature regarding the subject. The purpose leads to the research questions of the thesis:

**RQ1:** *How does the Swedish automotive industry include sustainability criteria in its decision-making? And does it differ between business functions?*

**RQ2:** *What are the most prominent challenges when considering sustainability in the decision-making process?*

**RQ3:** *To what extent do decision-makers in the Swedish automotive industry use corporate foresight to anticipate and prepare for future sustainability challenges and opportunities?*

## **1.4 Delimitations**

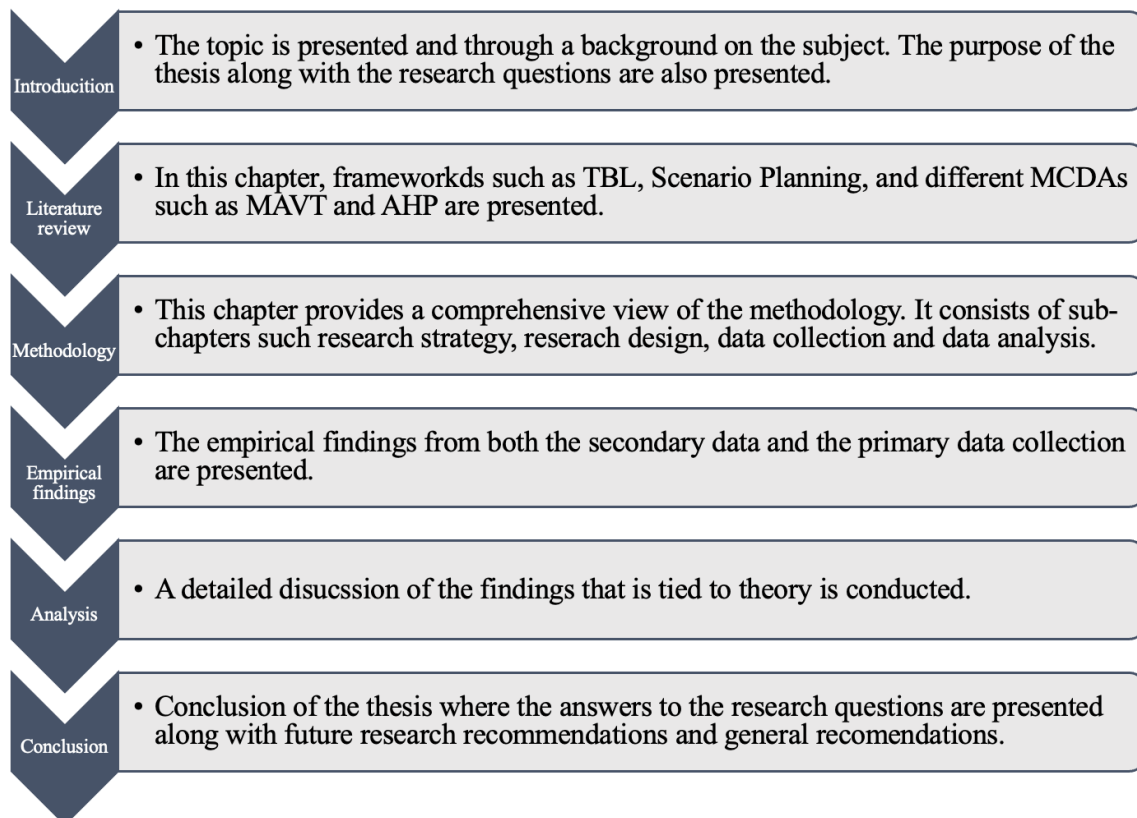
The automotive industry is facing increasing pressure to incorporate sustainability criteria into its decision-making processes. However, little is known about how this is being done in the Swedish context. This study aims to fill this gap by investigating how decision-making in the Swedish automotive industry is affected by sustainability criteria. This study will employ a qualitative research design, using semi-structured interviews as the primary data collection method. The study will target decision-makers from various business functions within the Swedish automotive industry, and data analysis will be conducted using thematic analysis. The first delimitation is the geographical scope. Since this study will focus exclusively on the Swedish automotive industry, other countries will be neglected. While other companies may have similar prerequisites, it will not be discussed in this study. The same applies to the industry as the automotive industry is solely studied.

As the purpose is to identify the effect sustainability criteria have on the decision-making process, the companies' actual sustainability performance, e.g., Co2 emissions, energy consumption, etc., will not be assessed nor discussed. Furthermore, the study is limited in its focus on stakeholders. Even though suppliers and customers are important factors in this industry's sustainability ambitions, only the automotive companies themselves will be considered. Lastly, this study will use corporate foresight, and more precisely scenario planning as a method for anticipating and preparing for sustainability challenges and

opportunities. While many similar methods can be of use for this purpose, this study will only use scenario planning.

## 1.5 Disposition

The disposition of the thesis follows a clear structure and the order of the chapters is presented in figure 1 below.



**Figure. 1.** Disposition of thesis

## **2.0 Literature review**

*This chapter presents relevant concepts and previous literature. The main focus will be to provide a thorough review of the existing literature, and will through the structured sub-chapters be presented as follows: first, the concept of triple bottom line, secondly, an exploration of the futuristic method of scenario planning, and lastly, different decision-making methods that can enable multiple criteria to be taken into consideration*

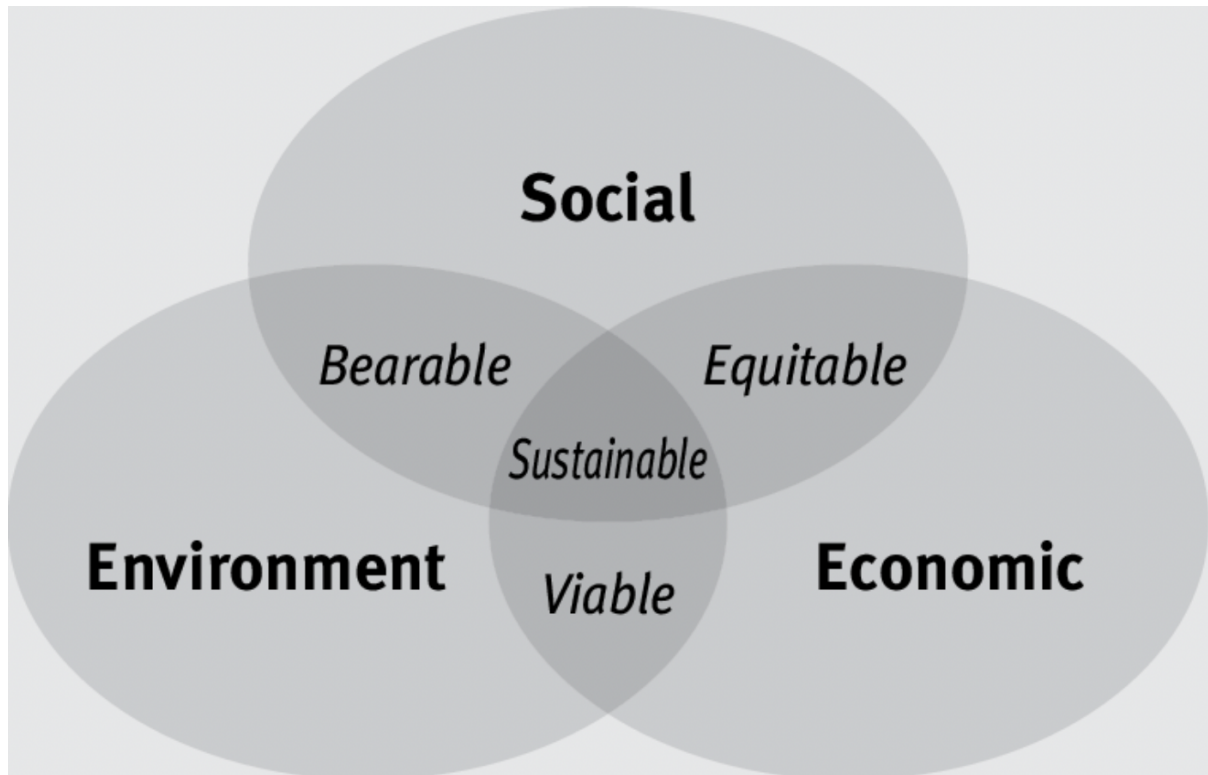
### **2.1 Theories and previous literature on the fields**

The literature review below examines relevant literature and presents different methods for decision-making. This has been done by starting broad to finishing with more specific tools for decision-making. First, literature on traditional concepts such as triple bottom line, scenario planning, and decision theory has been examined. To create a greater understanding of the conflicting sustainability criteria in decision-making, literature on the triple bottom line has been reviewed. The goal of decision-making is about making rational and informed decisions. As challenging as that may be, it can be improved by utilizing different methods. Scenario planning is a method organizations use to plan for the future. It allows organizations to plan for potential outcomes, follow up upon them, and thus make more informed decisions further on. It goes hand-in-hand with decision-making in that sense, and can further be motivated by its way of winnowing out ideas and predictions along the way, enabling decision-makers to make more rational decisions. Decision theory is an interdisciplinary field, however, it does capture important fundamentals regarding decision-making and its rationality. Secondly, literature regarding decision-making methods has been reviewed, and methods such as Multi-Attribute Value Theory (MAVT), Analytic Hierarchy Process (AHP), and Fuzzy Analytic Hierarchy Process (FAHP) have been examined. This examination seeks to foster a deeper understanding of complex decision-making within organizations. The methods chosen have been employed in previous studies that have examined how sustainability criteria have affected companies' decision-making. The last sub-chapter is the theory and rationale behind decision-making and will serve as a useful tool when analyzing the collected data.

## **2.2 Triple Bottom Line**

John Elkington first introduced the triple bottom line (TBL) concept in 1994. Elkington tries to include the value of social and environmental dimensions of a company instead of judging it mostly on economic measures, e.g., return on investment, profitability, etc. (Elkington, 1997). TBL is widely used in business and is often a synonym for sustainability both in literature and in practice (Alhaddi, 2015). Elkington describes TBL as an accounting framework that measures the performance of a company using three dimensions: economic, social, and environmental (Alhaddi, 2015). In short, TBL argues that to be sustainable, a company must consider all three of the dimensions equally and let them coexist in symbiosis as described by figure 2 (Elkington, 1997).

TBL was intended to be a guideline for companies that aim for a more sustainable future, and companies that wish to adopt sustainable business practices by not only including economic profitability but also the environmental and social impact of their actions as well. Elkington argued that for companies to be competitive in the long run, they must consider TBL (Elkington, 1997). In the definition of the TBL, Elkington refers to the 3Ps, people, profit, and planet as the three lines.



**Figure 2.** How to be “sustainable” according to TBL (Rogers & Hudson, 2011).

The environmental line refers to the potential consequences of an alternative to the nature and environment, e.g., the number of greenhouse gasses, chemicals, or effects on the ecosystem (Stoycheva et al., 2018). It focuses on how companies can minimize the footprint they leave on the world.

The social line refers to the potential consequences of an alternative to the stakeholders, e.g., the employees, the local communities, or politics (Stoycheva et al., 2018). In essence, it focuses on how companies conduct themselves in a way that is fair and beneficial to all stakeholders.

The economic line refers to the potential consequences of an alternative to the company, and on a micro and macro level. The economic dimensions can be further divided into sub-criteria, e.g., investment, return on investment, cost, etc. (Stoycheva et al., 2018).

TBL's flexibility and ability to be adapted to different business needs have aided its widespread adoption and its suitability for a wide range of businesses (Hall & Slaper, 2011). However, the implementation of TBL has its issues as well, particularly regarding measurement, especially the social and environmental dimensions. Furthermore, it is challenging to integrate the three dimensions of TBL in a company because people are trained to be specialized in one of the three dimensions rather than all of them. As a result, data collection is often performed separately for each dimension (Sridhar & Jones, 2013). This complicates the strategy and the decision-making process of a company and the implementation of TBL might be difficult. Some argue for the use of financial metrics across all dimensions, while others argue that it is not possible to assign financial values to certain social and environmental considerations (Alhaddi, 2015). It should be mentioned that even though the appeal of implementing TBL is substantial, letting the three lines coexist is difficult in practice (Jamali, 2006).

### **2.3 Scenario planning for corporate foresight**

Scenario planning is one form of corporate foresight. The term corporate foresight is widely used among companies to construct long-term strategies and future-oriented analysis. Therefore, to sustain growth and create a future for the company, corporate foresight can be used by decision-makers to prepare for turbulent times and events for which future-oriented techniques can generate options. (Vecchiato, 2015). The concept of foresight is criticized by the fact that too many external events can shift the playground, and thus make the planning irrelevant. However, a key pillar in this technique is that the future is not predictable, but that a company's actions today can influence its outcome further ahead and hence carry value through its preparations for it. (Vecchiato, 2015). Further, it is demonstrated that the automotive industry is an industry, where these techniques have grown in popularity, hence making the futuristic approach relevant for decision-making (Vecchiato, 2015), and as a tool for sustainable development (Destatte, 2010).

According to Ramirez et al. (2017), recent years have challenged many companies with their volatility. Events that are out of the individual or the company's ability to foresee as well as events that can be foreseen, both increase the interest in planning for different scenarios.

Scenario planning grew popular during the turbulent times after the Second World War. With the oil crisis during the 1970s, oil corporations such as Royal Dutch used it for their long-term strategy. Defining the chance of the scenario taking place can be done in different ways. What the future should look like is captured in the normative scenario planning. Calculating the best or worst-case scenarios is a part of building probabilistic scenarios, and the Oxford approach aims to capture the plausibility of the scenario. The objective of scenario planning is thus to iteratively generate new knowledge and insights so that organizations are better suited for making informed decisions and conceptualizing the circumstances and their environment by acknowledging the truth of uncertainty (Ramirez et al., 2017).

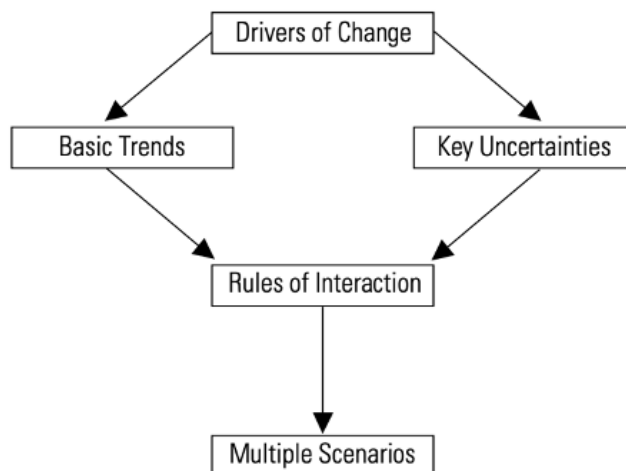
Myopic ideas and biases are often in the way of transitioning bold thoughts into potential outcomes. Companies that dare to question the status quo and face uncertainty position themselves to better embrace the uncertainty to their advantage. (Schoemaker, 1995; O'Brien, 2004) Scenario planning is a tool that can be used by managers and companies in their long-term strategies. The method is used for constructing long-term potential outcomes and hence be better prepared through continuously following up on how it develops (Schoemaker, 1995).

Scenario planning captures a large amount of different potential outcomes and limits the possible states, thus making it easier for companies to follow the development. Scenarios such as trade agreements, environmental changes, or new regulations are all built on numerous elements within the scenarios. Companies can then build models when these relationships are identified and formalized. Regarding other planning tools, scenario planning stands out in multiple ways. It offers an equal view of the uncertainties, it is more agile in adjusting to changes, and it is more extensive. Planning for different scenarios can be beneficial in many different contexts but is in large a set of tools to compensate for either predicting too little or too much, where the first is more common. The process of developing scenarios is done to see the uncertainties and trend changes with a broad scope (Schoemaker, 1995). In Table 1, an illustration of Schoemaker's (1995) steps for developing scenarios is presented.

1	Define the scope
2	Identify the major Stakeholders
3	Identify basic trends
4	Identify key uncertainties
5	Construct initial scenario themes
6	Check for consistency and plausibility
7	Develop learning scenarios
8	Identify research needs
9	Develop quantitative models
10	Evolve toward decision scenarios

**Table 1.** The process for developing scenarios (Schoemaker, 1995).

Both internal and external possibilities and perspectives should be included when developing scenarios.



**Figure 3.** Building blocks for Scenarios (Schoemaker, 1995)



As biases may influence what is to be seen as a tool to think freely about the future, scenarios may still be influenced by it. However, to break it down and potentially improve the scenario planning and mitigate uncertainty, there are three things to be considered about our knowledge. First, things we know we know. Second, things we know we don't know. Third, things we don't know we don't know. Since scenario planning is about conducting different predictions, understanding and focusing on the third point, things we don't know we don't know, is arguably the most important. Scenario planning is about challenging what we know with what we don't. (Schoemaker, 1995)

Presented in Figure 3, Schomaker (1995) illustrates the building blocks for scenarios. The first driver of change, trends, is argued to be a major driver of change in the automotive industry (PWC, 2023). Further elaborated by OECD (2016), megatrends will determine where most of the research and innovations will be aimed and invested in the next 10-20 years, many of which will impact the automotive industry. The second driver of change, uncertainties, is documented in the decision theory to have a great influence on decision-making (Brunsson, 1982).

Applied in many different industries, corporate foresight has grown to become an important and repeatedly used future-oriented technique among companies in the automotive industry. Due to other techniques' failure in generating appropriate grounds for decisions, future-oriented models such as scenario planning or roadmaps stand out as candidates to solve the problem of tackling environmental change. (Vecchiato et al., 2019)

### **2.3.1 Mitigating uncertainty through planning**

Environmental uncertainty (change) is referred to as the inability to accurately predict something and thus can affect managerial performance. As the environmental uncertainty becomes higher, the more specific the data must be and hence complicates the organizational planning. (Dwirandra & Astika, 2020). Strategic decision-making has long been haunted by environmental uncertainty, where external changes represent the most prominent challenges (Vecchiato et al., 2019). Milliken (1987) broke the uncertainties that senior, middle, and frontline managers face down into three types. First, the *state* uncertainties. Here, managers

have difficulty understanding the change in drivers of change over time. Second, *effect* uncertainty. Effect uncertainty refers to the impact it has on the business. Third, *response* uncertainty. As the word states, this last piece refers to the available responses to the uncertainties that the organization has (Milliken, 1987).

As argued by Vecchiato et al., (2019), approaching this uncertainty is best done through two so-called schools. The planning school encourages managers to predict more accurately, while the learning school emphasizes a more agile approach, where flexibility and the ability to quickly adapt are key. The planning school emphasizes the importance of planning and predicting as uncertainty arises and argues that managers who plan and predict outperform their peers. For managers to increase this ability, scanning and investigating the root of change and its evolution of it is of utmost importance. Here, scenario planning has become one of the most popular techniques (Vecchiato et al., 2019).

Identifying trends is key in scenario planning (Milliken, 1987; Schoemaker, 1995; Vecchiato et al., 2019) and the overall term of foresight allows firms to enhance their position for potential competitive advantage in the future, though carrying the risks of being the first mover. (Vecchiato et al., 2019). However, one of the great benefits of scenario planning is the potential reduction of managers' biases. It has the potential to expand the managers' view above and beyond their past experiences, and thus enable a greater view of the external environment, by preparing, and not anticipating (Vecchiato et al., 2019).

The automotive industry, argued by Vecchiato et al. (2019), is one of the industries that will undergo one of the greater transformations. Both in terms of customers, suppliers, and manufacturers will change and do so because of the emerging and new technologies in all stages of the supply chain. As the authors list several changes that will impact the evolution of the industry, such as self-driving cars and AI, the implication is as such that these technological and managerial changes will increase the uncertainty among established and leading automotive companies. Thus, the three uncertainties by Milliken (1987) are important to confront (Vecchiato et al. 2019).

Using the different foresight methods previously discussed is recommended for actors in the industry. Constructing scenarios can help managers deal with uncertainty and understand the evolution of the industry, as it at the same time carries the risk of sticking and locking managers into the new thoughts that they have gotten through scenario planning. However, managers at incumbent automotive firms are encouraged to use corporate foresight, which can be used for future-oriented questions such as disruptive innovations, how the industry is evolving, new entrants, barriers, necessary resources, etc. (Vecchiato et al., 2019).

## **2.4 Sustainability-measures impact on financial performance**

Growing concern and awareness of the impact of corporations has increased the pressure on companies to re-evaluate and adapt to what is necessary for reaching the common goals of a sustainable future. ESG, a set of tools that captures the criteria of environmental, social, and corporate governance, and Socially Responsible Investing (SRI) which captures socially responsible investments have grown in popularity as tools for investors to screen for sustainable companies. The first, ESG, has quickly caught legitimacy in corporations' long-term strategies to shed light on sustainable and social transparency. (Mullor et al., 2022)

According to Heinsz et al. (2109), ESG can be defined as a set of criteria used to evaluate a company's environmental and social impact on society. The first pillar, environmental, captures a wide range of environmental aspects. The carbon emission, waste management, or energy consumption of a company is captured in the E of the acronym. The social aspect covers the relationship with institutions, people, and communities. Companies affect societies and hence include measurements such as labor rights and diversity. Governance at large captures the transparency of the firm. Both internal factors such as systems and procedures, and external factors such as stakeholders are included in the governance aspect (Henisz et al., 2019).

The increased awareness of the corporate impact on society has led investors to allocate in line with environmental, social, and governance standards, as it has attracted significant attention to its academic field (Daugaard, 2020). In one of the most comprehensive studies in ESG literature, Friede et al. (2015) examine over 2200 ESG articles to identify an exhaustive

consensus. Their findings indicate that the literature agrees in a majority that there is a positive correlation between corporate financial performance (CFP) and ESG, i.e., that ESG has a positive effect on the financial performance of the company. However, Daugaard (2020) argues that this has led to a too-concentrated measurement. That diversity in the analysis of ESG is left out and financial performance is the dominant metric in the field – leaving other themes, such as the cost of ESG and the management aspect undiscovered.

## **2.5 Life cycle assessment**

Scenario planning includes building different future scenarios, where the outlook of an industry differs. Life cycle assessment (LCA) is a method that builds upon these scenarios where the assessment will consider the environmental impact a product has in the different scenarios. LCA is a method for evaluating the impact a product has on the environment over its life cycle (Nordelöf et al., 2014). This is done by measuring the impact from its material extraction to the end-of-cycle. By considering the impact across all stages, companies can identify opportunities to reduce environmental impacts. In the automotive industry, LCA is a useful tool because it helps decision-makers evaluate the environmental impact different products have. The automotive industry is unique, where most of the environmental impact happens after the purchase is made, meaning that fuel consumption is the main factor (Bergbaum et al., 2021).

The method of conducting LCA is based on the International Standard of Organization's ISO 14040 and consists of the following four steps: (1) a goal and scope definition, (2) an inventory analysis, (3) an impact assessment, and lastly, (4) interpretation (Finkbeiner et al., 2006). The first part includes defining the goal and the scope of the LCA, which could include the product, the unit, the system, etc. The second part includes compiling a detailed inventory of all the inputs and outputs of the product being analyzed, this could be materials, fuel, or emissions. The third part includes evaluating the different environmental impacts the product has by looking at the inventory identified in the second step. Lastly, the interpretation of the result of the impact assessment is conducted, where the goal of the study, the data used, and the assumptions made are analyzed (Nordelöf et al., 2014).

To summarize LCA, in today's society the focus on sustainability is often a factor in the decision-making process. The automotive industry is using tools like LCA to evaluate the environmental impact of their products and directing their R&D thereafter to increase theirs. As consumers demand more sustainable products, the automotive industry will prioritize sustainability in their decision-making processes, thus it is crucial to incorporate LCA in their process.

## **2.6 Decision theory**

Brunsson (1982) argues that decisions making within corporations tend to be irrational, and that bias plays a role in that. Much of the literature has focused on how firms can increase rationality in decision-making (Brunsson, 1982) and how uncertainty affects the decision-making process (Hewitt et al., 2022). However, much of making decisions is about the actions taken from it, and irrationalities can work as a springboard for firms to act (Brunsson, 1982).

The decision-making perspective is argued to be one of the more influential perspectives in the social science literature. The perspective in large captures the behavior in decision-making from either an individual, larger group, or corporate point of view. The field is well documented in the literature and covers the creation and choosing of alternatives as well as the criteria needed for choosing (Brunsson, 1982). Further, as decision-making is heavily influenced by uncertainty, scenario planning and understanding what the different scenarios mean, allows managers to better prepare for making decisions under uncertain times (O'Brien, 2004). Stakeholders' part of decision-making has grown stronger as the growth of organizations has created a sort of hierarchy in society and demonstrates that few are making the decisions and many that carry them out. Even though the literature may distinguish between individual or corporate decision-making, the process is homogeneous because decisions taken within a larger corporation or organization often are done so from one person or a small group of people with the most power (Brunsson, 1982).

The criteria for a so-called rational decision are covered in normative research, where the decision-making perspective is dominant in terms of how much has been written and

researched in its field. These criteria can be everything from different problems, i.e., when there is either too much or too little information, to alternatives (Brunsson, 1982).

Rational decisions are not always necessary considering the need for action. However, mitigating irrationality is arguably necessary. Irrational decisions can arise due to different reasons. Despite this, there are some more common reasons for it. First, the people making the decisions lack the cleverness to be rational in their thoughts. Second, it is inherent, hence difficult to train away. Lastly, too much or too little data creates restrictions, which eventually has led researchers to produce, among other things, multiple-criteria methods such as the Analytical hierarchy process (AHP). (Brunsson, 1982; Saaty, 1981; Stoycheva et al., 2018).

Further, according to the rational model, as many alternatives as possible should be evaluated, thus in need of a multi-criteria method that enables such a thing. However, considering both the positive and negative consequences of every alternative may evoke uncertainty and doubt among decision-makers (Brunsson, 1982).

## **2.7 Decision-making methods**

There is no shortage of decision-making methods used for prioritizing and selecting the best alternative. Using frameworks could ease the process, especially if a decision has multiple criteria that are different. Evaluating the alternatives in a decision process based solely on financial data is straightforward because you can collect the data that usually are easily available. When you include more criteria such as the environmental criteria, it becomes more difficult to collect the data and simple decision methods are not appropriate.

In this chapter, different methods will be described. These include the MAVT, the AHP, and the Fuzzy AHP.

### **2.7.1 Multi-criteria decision-making**

In most decision-making processes there are several different criteria that the decision-makers must weigh against each other. To be able to effectively decide in these situations, compromises must be made. There have been several frameworks proposed with the goal of

simplifying the process. Frameworks widely used are often based on multi-criteria decision analysis (MCDA), which incorporates multiple factors in evaluating decision options. MCDA calculates the score of each option by considering stakeholders' preferences and performance data. (Stoycheva et al., 2018). Some of the most used MCDA frameworks include AHP and the MAVT (Cinelli et al., 2014). Furthermore, Steele et al. (2009) suggest that using MCDAs in sustainability decision-making is beneficial.

The traditional way of using MCDA is through a quantitative approach, it was developed to aid in the process of a decision maker. One of the reasons why the approach became widely adopted is because the method factors out the human factor out of decisions (in the purely quantitative approach) to some extent, which results in a more objective decision-making process (Oliveira et al., 2013). Because the MCDA by design includes multiple criteria in the approach, it is easily designed to include criteria that the organization deciding wants to include.

As for most MCDA methods, different criteria must be identified to be able to evaluate the different alternatives. Most MCDA frameworks for sustainable purposes use the “triple bottom line” framework to aid in identifying criteria. As mentioned in sub-chapter 2.1, TBL is an accounting framework that incorporates the social, environmental, and economic dimensions of a business (Elkington, 1997). Sustainable MCDA methods can use TBL as a basis for their criteria in their decision-making process to then divide it further into sub-criteria. As Stoycheva et al. (2018) describe, the *environmental* impact examines the potential consequences of an alternative to the nature and environment, e.g., the number of greenhouse gasses, chemicals, or effects on the ecosystem. The *social* impact examines the potential consequences of an alternative to the stakeholders, e.g., the employees, the local communities, or politics. The *economic* impact examines the potential consequences of an alternative to the company, on a micro and macro level. The economic dimensions can be further divided into sub-criteria, e.g., required investment, return on investment, cost, etc (Stoycheva et al., 2018).

### **2.7.2 Multi-attribute Value theory**

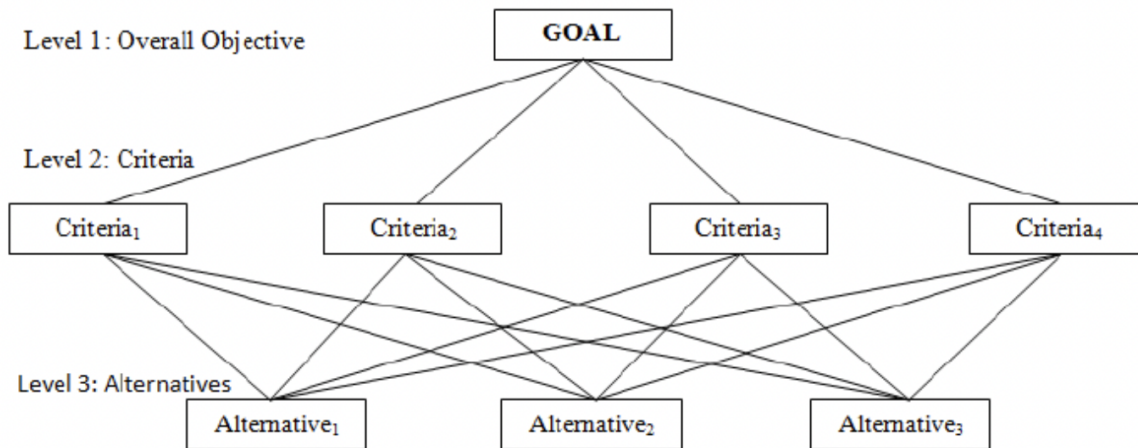
Stoycheva et al. (2018) use the multi-attribute value theory (MAVT) in their study of the automotive industry. The purpose of MAVT is to provide a systematic and transparent way of combining multiple attributes into a single decision-making criterion. The MAVT compares different alternatives quantitatively, where it determines the expected performance (value scores) of each option for a task. Using a weighted sum formula, where the relative importance of each criterion is combined with the performance score for the different alternatives. The method is useful in handling conflicting criteria and integrating different measurement systems (Stoycheva et al., 2018).

MAVT is widely used in fields such as engineering, environmental science, marketing, and transportation to evaluate the trade-offs between multiple criteria when making complex decisions. The results of the MAVT analysis can help decision-makers to prioritize their goals and determine the best alternative (Stoycheva et al., 2018).

### **2.7.3 Analytical Hierarchy Process**

A famous MCDA framework is the analytical hierarchy process (AHP). The AHP is a widely utilized decision-making method that was first introduced by Thomas L. Saaty in the 1980s (Saaty, 1981). It has been applied in a variety of industries and contexts for decision-making purposes. The AHP utilizes a hierarchical structure to weigh the relative importance of different criteria in the evaluation of alternatives as described in Figure 4. These criteria weights symbolize the significance of each criterion concerning the overall goal. It is a method that organizes complex decisions (Oliveira et al., 2013). Because the AHP method uses multiple criteria, different sustainability criteria can be included and thus it can be employed in sustainability methods in the automotive industry.





**Figure 4.** Generic structure of an AHP (Agarwal et al., 2014).

The traditional AHP process involves the following steps: (1) the identification of the goal, (2) the definition and determination of different criteria, (3) the evaluation of potential alternatives using the criteria, and finally, (4) the selection of alternatives following the goal.

To determine the relative importance of the different criteria, AHP performs pairwise comparisons at each level of the hierarchy (Görener, 2012). Stakeholders assess every criterion against each other, assigning a weight of importance on a scale from 1 to 9, where 1 means the criteria is equally important and 9 means one of the criteria is extremely important compared to the other. This is to derive the best decision from the different alternatives (Görener, 2012).

Despite its ability to provide a well-balanced perspective on a problem, one of the major limitations of the AHP method is its dependence on uncertain information such as experts' subjective experiences, which can make it difficult to evaluate data quantitatively. (Kumar & Vaidya, 2006), however, an extension of the method has tackled this by using fuzzy logic/numbers. Other limitations of AHP are the time consumption it requires to assess the different weights to assign to the criteria and the time it requires to do the pairwise comparison of the criteria where you evaluate the trade-offs (Cinelli et al., 2014).

The nature of the AHP method allows for the inclusion of new criteria, therefore including environmental criteria would not be an issue. To evaluate a decision based with regards to sustainable aspects could be sustainable impact, social impact, technical impact, etc.

In the article by Oliveira et al. (2013), a case study is conducted regarding the painting sector of an automotive plant. The authors tested the applicability of two different MCDA methods, namely the MMASSI method and the AHP method. Through a case study of the company, they concluded that from the point of view of the decision maker, the MMASSI method was easier to use and easier to understand. However, when regarding the structuring of the problem, the AHP proved to be better than MMASSI, and it forced the decision-maker to reflect more (Oliveira et al., 2013). The use of MCDAs is becoming more popular with companies because of the potential of optimizing the decisions taken, the authors suggest that MCDAs make the process more efficient, it is easier to use, and it makes the process more rational (Oliveira et al., 2013).

AHP is useful in different circumstances and it is prevalent in several business areas. It is applicable when dealing with situations where multiple alternatives appear, situations where organizations must rank different alternatives, and situations where you must prioritize different alternatives based on the merit of members (Forman & Gass, 2001). As mentioned, the TBL states that for a company to be sustainable, it must consider the economic, social, and environmental dimensions equally (Elkington, 1997). In practice, these dimensions are conflicting with each other, making the decision complex, in these situations, the AHP is suitable (Saaty & Peniwati, 2008). When determining the most sustainable option to produce cement in Indonesia, AHP was applied where it was based on three criteria: economic, social, and environmental impact (Putra et al., 2020). Ali et al. (2015) examine how different decision methods can be used in sustainable manufacturing. Through applying MCDA methods, they look at how well-suited the method is when automotive companies are selecting composite materials alternatives. AHP is proven to be effective in solving decision problems where conflicting criteria affect the process although it is suggested that the AHP could become difficult to use when the number of alternatives increases (Ahmed Ali et al., 2015).

#### **2.7.4 Fuzzy Analytical Hierarchy Process**

An extension of the AHP (called Fuzzy Analytical Hierarchical Process or FAHP) was proposed by Chang (1996) which accounts for the difficulty of measuring social and environmental impacts. It is used to determine the weight of the different criteria. As mentioned, a FAHP is applied to reduce the uncertainty of the subjective perspective of experts and when measuring the criteria quantitatively is complex (Mardani et al., 2015). The framework allows for quantifying qualitative data, called fuzzy numbers, which allows for an appropriate representation of subjective preferences, thus making it suitable for handling uncertainty and subjectivity in decision-making (Calabrese et al., 2019). Because FAHP includes qualitative data makes it more suitable for situations where a company must consider the social and environmental aspects of a decision (Calabrese et al., 2019). The framework utilizes both qualitative and quantitative criteria, therefore, providing a more comprehensive picture when evaluating TBL decisions (Chan et al., 2008). Because the evaluation of both social and environmental criteria is difficult to measure, FAHP is important for prioritizing the sustainability perspective of the business realm (Chan et al., 2008).

As described by Liu et al. (2020), fuzzy numbers are numerical representations used to deal with uncertainty in decision-making. Precise numbers, e.g., profitability, have exact values, while fuzzy numbers are a way to express degrees of membership or possibility. Membership functions are used where a value between 0 and 1 is assigned to the corresponding fuzzy number indicating the degree to which those values belong to the fuzzy number. This allows decision-makers to deal with incomplete or vague information. Therefore, by incorporating fuzzy numbers, a more objective evaluation of alternatives can be done (Liu et al., 2020). It should be mentioned however that the use of fuzzy numbers requires careful interpretation and they can be difficult to compute without the right knowledge.

Ghadimi et al. (2012) combined the use weighted fuzzy assessment method combined with FAHP for sustainable product manufacturing within the automotive industry. They propose that combining the two models is an advantage because integrating the human element into the decision-making process makes it more precise (Ghadimi et al., 2012). The result of the study demonstrates that a simple replacement in the manufacturing process (e.g., finding new

material) can aid the manufacturer to produce more sustainable goods and thus possibly reducing excessive waste and lower operational costs.

### **2.7.5 Criteria used in previous studies**

When making a complex business decision, a company must consider different criteria to find the optimal decision. As mentioned, the criteria are often different in nature and outcome and companies must decide which criteria to consider in their decision-making process.

Most of the literature that focuses on sustainable MCDAs use economic, social, and environmental as their criteria, which is then further divided into sub-criteria (Ghadimi et al., 2012; Putra et al., 2020; Stoycheva et al., 2018). As described in sub-chapter 2.2, these three criteria are needed for a company to be sustainable according to Elkington (1997), and therefore can serve as a basis for when deciding on which criteria to include in an MCDA.

Most previous literature has used economic criteria when developing their models, which look at the economic effect a decision has on the company in question but also on a bigger scale. According to Stoycheva et al. (2018), the criteria should consider the effect the decision has on the suppliers as well as the end consumer because the decision will have an impact on them. Cost is a frequently used criterion to evaluate different criteria, along with profitability which is frequently used (Ghadimi et al., 2012; Putra et al., 2020; Stoycheva et al., 2018). Quality is another sub-criterion commonly used in the economic criteria (Ghadimi et al., 2012).

There is a gap in the literature regarding how the sustainability criteria affect the decision-making process in companies. Stoycheva et al. (2018) include sub-criteria such as pollution (e.g., GHG emissions), resource consumption, and impact on plants and animals in their study. When conducting a case study of a painting sector of a Portuguese automotive plant Oliveira et al., (2013) include criteria such as quality, energy consumption, paint consumption, and quantity of painted vehicles. To optimize the sector, they use these criteria to evaluate which alternative to move forward with (Oliveira et al., 2013). Ghadimi et al.

(2020) investigate how to select a sustainable supplier with the help of MCDA and they use sub-criteria for sustainable product design and sustainable management systems.

Commonly used criteria in MCDAs case studies are different types of emissions (Ghadimi et. al, 2012; Stoycheva et. al, 2018), e.g., atmospheric impacts such as GHG emissions could be included. Similarly, to emissions, pollution in local areas could also be included, for example, how much plastic waste will be expected from this product (Ghadimi et. al, 2012). Other studies incorporate resource consumption (Oliveira et al., 2013; Stoycheva et. al, 2018) of the MCDA, which is an important aspect in sustainability.

The articles mentioned above also use social criteria to some extent. The sub-criteria differs among researchers as there are many different aspects of social sustainability. Some researchers included the effect the alternative has on stakeholders (Ghadimi et al., 2012), while others included the impact it has on employment and society (Stoycheva et al., 2018).

## **2.8 Main take-aways from the literature review**

For a company to be sustainable according to Elkington (1997), it requires companies to consider all three dimensions, environmental, economic, and social. The framework highlights the importance of having a holistic approach to decision-making where these dimensions are considered equally. Scenario planning is considered a valuable tool for automotive companies when they are planning for a sustainable future. By utilizing this set of tools, companies can identify and prioritize sustainable practices, mitigate uncertainties, and track the progress and developments of the scenarios. When making complex decisions in the automotive industry, it has been shown that MCDAs can be used to incorporate multiple conflicting criteria. MCDAs help companies to consider multiple criteria by using weighted scores, hopefully leading to more informed decisions. Lastly, using fuzzy numbers can aid in measuring qualitative data, thus allowing criteria that are difficult to measure such as environmental and social criteria, to be included in the decision-making process

## **3.0 Methodology**

*This chapter will present the methodology used in this thesis. The first sub-chapter will present the research strategy, design, and approach that was followed. Thereafter, the data collection methodology that is presented consists of semi-structured interviews and a literature review. Additionally, the data analysis method is established. Finally, the last sub-chapter presents how the thesis highlights the different quality criteria that have been considered.*

### **3.1 Research Strategy**

Choosing the right research strategy is crucial for the result to be conclusive and reliable. There are generally two methods you can choose between, a qualitative study or a quantitative one. A qualitative research strategy focuses on collecting data such as words or images among other things, it is often used to investigate people's perspectives and motivations on a subject and to investigate social issues. While a quantitative research strategy focuses on collecting data in the form of numbers to investigate the relationship between the variables (Bell et al., 2019). This study concluded that a qualitative approach is more suitable because it aimed to investigate how sustainability criteria have impacted the Swedish automotive industry and therefore this thesis set out to investigate how decisions are made on a deeper level. The thesis aimed to understand Swedish car manufacturers and how they resonate. This topic is subjective, and companies will have different opinions depending on which company they work for and their personal beliefs. To investigate the topic on a more complex level, a qualitative research strategy was needed (Gioia et al., 2013).

The advantages of using a qualitative research strategy include the ability to examine the words and experiences of the interviewees, which can help to reveal patterns and insights that may not be apparent through other types of data collection. Additionally, the flexibility of a qualitative research strategy allows for adjustments to be made in the data collection process during the interview process, enabling the authors to further explore and clarify important themes and ideas.

It should be mentioned however that a quantitative approach could also be helpful when examining this type of subject, to see in an objective manner where the money a company invests in R&D goes, but this would be difficult to attain. If a quantitative strategy was selected, then the authors could have used the data to examine which type of investments the companies are doing, however, this has been done before.

There are generally two approaches you can take when conducting research, an inductive and deductive approach. When conducting qualitative research, an inductive approach is usually taken, i.e., the result of the research aims to establish and form the theory (Bell et al., 2019). The problem with this approach is that it may be difficult to establish a theory because of the limitations of the data collected (Bell et al., 2019). Due to the different limitations, an inductive approach was difficult for this thesis. The deductive approach on the other hand uses existing theories as its basis for the research. This limits the scope of the research as it is tied to the theory (Bell et al., 2019). However, there is a third option that could be taken. An abductive approach can be viewed as a mix between the two previous approaches, where it seeks the best explanation of the data based on existing theories (Bell et al., 2019). As there is limited research done on how sustainability has affected the decision-making process and the subjectivity in the subject, an abductive approach was deemed most suitable. This thesis gathered theories and concepts through a literature review to then apply the data collected to the existing literature. Therefore, the deductive and the inductive approach were combined, i.e., an abductive approach was followed in this thesis.

### **3.1.1 Limitations of qualitative research**

There are of course some limitations when conducting a qualitative study. These include a lack of transparency, problems with subjectivity, problems with generalizability, and biases. In the context of this research, lack of transparency was a potential issue because the interviewees might not be able to be transparent with us because of the risk of damaging the company. Furthermore, the research relies on the subjective experiences and perspectives of the interviewees, which can make it difficult to ensure objectivity when examining how sustainability has affected decision-making. When conducting qualitative research in general there will often be a problem with generalizability. This thesis was no different, ideally, the

authors would have liked to interview at least 12 different people, but due to the size of the sample, the result of the research may not be representative of the industry and thus not be able to generalize the conclusion of the thesis. Lastly, the research suggested was prone to the authors' own biases, as the authors may have had preconceived notions or expectations about the impact of sustainability on companies that influenced the data collection and the data analysis. This is called confirmation bias and it is important to take the necessary steps to avoid this. (Bell et al., 2019)

A qualitative strategy was still the best option for the proposed area of research, as mentioned the purpose of this thesis was to investigate how the Swedish automotive industry's decision-making has been affected by sustainability.

### **3.2 Research design**

The data was collected at one point in time from different automotive companies in Sweden and how sustainability has affected their decision-making processes. For this thesis, a multiple case study design was chosen. A case study allows for in-depth findings on a topic, which can assist the theory-building part of the thesis. It can be described as the analysis of a case, where the case can be a person, an event, or an organization (Bell et al., 2019). The objective of this thesis was to gain comprehensive insights into the topic. Therefore, a multiple case study approach was suitable (Yin, 2009). It focused on three companies and their business functions operating in the Swedish automotive industry. The selection of multiple cases aligns with the recommendations of Bell et al. (2019), as it allowed for a comparative analysis of the business functions. Therefore, it strengthened the argument for using a multiple case study design. Although a single case study may have resulted in a deeper understanding of the topic, the authors believed that a multiple case study was more suitable to answer the research questions as it allowed for comparison between functions. Furthermore, a single case study may have resulted in a conclusion less generalizable or a scope that is too narrow. To be able to investigate the pattern between participants a semi-structured interview guide was constructed to standardize the research to increase its validity.



Due to the limited studies conducted in the area, an exploratory research design was deemed suitable. The research questions of this study aimed to answer the “how” of the subject, thus an exploratory study was suitable (Saunders et al., 2019). The nature of exploratory research is more flexible than other research designs and this allowed the authors to include new findings in the process to enhance the process (Saunders et al., 2019). Furthermore, when having an abductive approach to your research, an exploratory design is beneficial.

The authors used a flexible research design, meaning that the author was allowed to make changes to the original plan as needed during the research process, for example, it could have been changing the interview guide because of a new finding. The approach is known as an emergent approach as explained by Pailthorpe (2017) as the ability to incorporate new ideas, information, or concepts that are discovered in the research process, this could add depth to the data and therefore result in a more nuanced thesis. The authors expected some complexity and since there was not a huge amount of existing data on the subject on a deeper level, an emergent research design is preferred.

### **3.3 Data Collection**

#### **3.3.1 Primary data collection**

The complexity of understanding the decision-making process called for the chosen strategy for this thesis to be qualitative and to collect the most in-depth data, the primary data for this thesis were collected through interviews. There was less focus on hard data, i.e., data that could be found for the general public, such as the annual reports. The methods used for collecting qualitative data were focused on words rather than numbers to understand the attitudes, beliefs, and perhaps for this thesis, in particular, the behaviors.

Semi-structured interviews were our main source of data, meaning that the interview followed a pre-determined structure, but additional questions could be asked depending on the participant. In other cases, focus groups and observations can be of use when conducting a qualitative study. For the data to be strong, reliable, and comparable, the authors aimed to interview leaders within the relevant field of our study. The authors had a clear objective for

this research and with the research questions determined, a semi-structured approach is appropriate (Bell et al., 2019).

### **3.3.1.1 Interview design**

As mentioned, the authors collected the primary data by utilizing semi-structured data. The aim was to gather deep insight into the topic and hence open-ended questions were asked so interviewees could provide more detail and depth in their answers (Bell et al., 2019). Open-ended questions are designed to elicit in-depth and detailed responses from participants. Therefore, the use of semi-structured interviews was appropriate, as it allowed the authors to understand the interviewees' perceptions of the topic, and they got the opportunity to elaborate on their responses (Bell et al., 2019). This meant that the authors prepared an interview guide ahead of the interviews to reassure that the research questions could be answered, although some of the follow-up questions asked in the interview were based on the answer of the participant. It should be mentioned, however, that there is a risk of leading the participant when asking follow-up questions, and something that the authors had to take into consideration (Bell et al., 2019).

When the interview guide is more structured, i.e. a questionnaire, the comparability increases as the same questions are asked (Cint, 2022) but when constructing a semi-structured interview guide, the main questions will be the same for all the participants allowing for comparison between them (Bell et al., 2019). It is important when interviewing in a semi-structured manner that you do not lead the participant, because then the data collected is not as credible. To remain objective in the interviewing process the authors must help each other in this regard. To test the interview guide, a simulated interview was conducted to ensure that the interview guide is suitable. The interview guide started broad to continue with more specific questions connected to the research questions.

### **3.3.1.2 Selection of Participants**

The primary data in this thesis was collected by conducting semi-structured interviews. Choosing the right sample was an important aspect of this research, as it influenced the credibility of the thesis. The participants needed to be representative and an accurate

representation of the population for generalizable results, therefore the sample was not random. This is called purposive sampling, meaning that the sample has been chosen based on the ability to answer the research questions posed (Bell et al., 2019). The employees of the Swedish automotive industry were chosen as the subjects. As the thesis aimed to investigate how sustainability has affected decision-making, the participants had to meet some criteria to be considered as suitable. The first criterion was that the participant was in a position with relevant experience in an automotive company, where they were involved in the decision-making process. This was to ensure that they understand the decision-making process. The second criterion was that the participants had experience with sustainability, which affected their decision-making. This was to ensure that they understand the impact sustainability has had on companies. These criteria were chosen to make the research nuanced and receive more insight. The participants were contacted through e-mail or LinkedIn, and a meeting was set up after initial contact.

The participants represented different companies and functions within the Swedish automotive industry. Three of the participants were controllers, who worked in the finance function. Two of the participants were top management, who both had 25+ years of experience in the industry. The other participants represented functions such as the risk function and the innovation function. As the functions were different, differences were identified between them. The companies studied in the thesis were Volvo Cars, Lynk&Co, and Polestar.

Regarding the size of the sample, the focus of this thesis was on collecting data that were of high quality. Thus, the focus was on selecting the right participants and gathering valuable insights by analyzing the data comprehensively. This meant the authors did not focus on collecting as much data as possible, as it would increase the workload significantly and potentially damage the analytical process. There are different suggestions about the size of a sample in a qualitative study, Bell et al. (2019) suggest that a sample size ranging between five and 25 is deemed most suitable. This thesis had a sample size of eight, their characteristics and the characteristics of the interview are described in Table 2.

<b>Respondent</b>	<b>Role</b>	<b>Company</b>	<b>Date Of interview</b>	<b>Duration</b>	<b>Medium</b>
R1	Innovation manager	Lynk&Co	2023-03-16	42 min	Teams
R2	Country manager	Volvo Cars	2023-03-17	69 min	Zoom
R3	Former senior VP	Volvo Cars	2023-03-27	65 min	Zoom
R4	Business Controller	Volvo Cars	2023-03-29	45 min	Zoom
R5	Strategy controller	Volvo Cars	2023-03-31	33 min	Zoom
R6	Senior director Risk management	Volvo Cars	2023-03-31	48 min	Zoom
R7	Business Controller	Polestar	2023-04-05	52 min	Zoom
R8	Anonymous	Anonymous	2023-04-12	65 min	Skype

**Table 2.** *The participants of the study.*

### **3.3.1.3 Interview setting**

Before each interview, an e-mail was sent out to the participants, where information about the purpose of the thesis, and the interview guide were shared with them. Additionally, practical information such as a link to the meeting and duration of the meeting was also shared. The reason for providing the interview guide is because it allowed the participant to prepare and if needed, gather information to better be able to answer the questions. When participants can prepare themselves, they can give more nuanced and in-depth answers (Bell et al., 2019). All

interviews were conducted through video calls via Microsoft Teams or Zoom, both due to the flexibility it provides and also because some participants were not located in the same area as the authors. There are some limitations to conducting interviews digitally compared to physical meetings and some argue that the quality of the interview might decrease. The risk of having a technological issue, where the internet is unstable, or the link does not work as intended. There is a risk of not being able to read the body language of the participant when conducting online interviews, however, using webcams can mitigate this risk a bit (Bell et al., 2019). Another risk is that the audio quality might be poor. Despite the pitfalls, the authors decided to conduct all interviews online because the flexibility it provides will ease the process of booking interviews and because the focus of this thesis is on the participants' answers, not their body language. The use of digital meetings also limits the time of participation, thus increasing the likelihood of participants accepting to be interviewed.

The interviews were held in Swedish and English. Ideally, the authors wanted to conduct the interviews in their native language (Swedish) to minimize the risk of misunderstandings, but as some of the participants did not speak Swedish, the interview had to be held in English. As the authors did not know most of the participants, the first minutes of the interviews aimed to establish trust, and they were asked permission to record the interview to then produce transcripts later on. This allowed the authors to focus on listening and asking the right follow-up questions (Bell et al., 2019). It also allowed the authors to revisit the interviews during the analysis thus increasing the depth of the study.

### **3.3.2 Secondary data collection**

Secondary data is the part of the thesis that consists of the work done in previous studies (Bell et al., 2019). In this thesis, secondary data can be found in the theoretical framework and the form of yearly reports published by the companies. The theories and concepts chosen were collected by conducting a systematic literature review. By having a systematic approach to collecting the secondary data, the transparency of the research increases and the understanding of the topic is deepened (Bell et al., 2019). To achieve this, a structured research question was needed, where the goal of the research was clear, then certain keywords were chosen.

The secondary data collection was conducted before the primary data collection to develop a good understanding of the topic. After the authors had a better understanding, the semi-structured interview guide was constructed and the interview was conducted, in line with an abductive approach.

### 3.4 Literature review

As mentioned, the goal of the research is to deepen the understanding of how sustainability has affected the decision-making process and to generate recommendations for navigating the complex nature of decision-making. This called for a literature review where what is known about the subject is collected and reviewed (Bell et al., 2019). Following the formulation of the research question, the keywords were formed. The use of keywords when conducting a literature review is an effective way to make the process smoother and more detailed. In addition to this, the snowball effect was used to find more relevant articles (Collis & Hussey, 2014).

In Table 3 the keywords used and the exclusion criteria are presented, it was important to have exclusion criteria to limit the articles. The inclusion criteria presented defined the characteristics of the articles in this thesis.

The databases used in this literature review were; Google Scholar, Supersök by Gothenburg university library, and Business Premier. All these databases are widely used and well-trusted, which increases the reliability of data.

Inclusion criteria	Exclusion criteria
Peer-reviewed and non peer-reviewed articles	Articles with an insufficient amount of quotations
Articles in Swedish and English	Articles in another language

Articles about decision-making that include multiple criteria	Articles outside the scope of relevance
---	---

**Key words:** Decision-making, Sustainability, Environmental sustainability, Scenario Planning, Triple Bottom Line, Automotive industry, MCDAs, AHP.

*Table 3. Inclusion and exclusion criteria and key words used.*

### 3.5 Data analysis

The process of analyzing the qualitative data can be done through several different approaches. The goal and purpose of analyzing the data were to provide a deeper understanding of the studied participants' experiences, thoughts, and actions within the sustainability area by breaking the data down to identify these patterns or distinctions. The approach most suitable for this thesis was thematic analysis. Through a thematic analysis, the data can be analyzed by identifying, coding, and interpreting themes (patterns) that are related to the research question (Bell et al., 2019). This method of analysis offers flexibility and can be adapted depending on the research questions. Identifying themes of the data enables deeper analysis and understanding of the perspectives and experiences of the participants. The importance of the transcripts should be mentioned, as they served as a basis for the analysis. The analysis was conducted alongside the interview process as suggested by Patel and Davidsson (2011). It enabled the authors to understand the topic better and thus enhanced the process as well. After a transcript was made, it was followed by a review and summary of the interview to capture the most important points. Bell et al. (2019) suggest that summarizing the interview is an important step of the analysis process.

The coding was done in two parts: first-order analysis and second-order analysis. In the first-order analysis, the identification of codes and terms is done. The second-order analysis included the construction of the themes and concepts (Bell et al., 2019). The first part of the coding was done during the transcription process where the authors had a first glance at the data. Then, the identification of the codes was done, which was followed by a discussion where the authors tried to identify the themes. During the first-order analysis, it is important

to identify repetitions, or the codes, across the transcripts to find the patterns (Bell et al., 2019). After the first-order analysis, the patterns were established, and the authors organized them in a more manageable way. In the second-order analysis, the codes and patterns identified were grouped into a relevant theme of the thesis. This was an iterative process, as the understanding of the subject and the data deepened, codes were changed.

When conducting a thematic analysis, one of the main goals is to identify the themes of the interviews, which means recognizing similarities across interviews. The use of semi-structured interviews aided the thematic analysis because the participants had the same type of questions. The use of semi-structured interviews in this thesis allowed the authors to compare the insights and experiences of the participants, which was beneficial for the thematic analysis. The pitfall of this, however, is the risk of just identifying repeating themes, instead of identifying the relevant information. (Bell et al., 2019)

### **3.6 Research quality**

For qualitative research to be considered trustworthy, there are four different aspects the authors must consider. Lincoln and Guba (1985) suggest increasing the reliability of qualitative research, criteria such as *credibility*, *transferability*, *dependability*, and *confirmability* must be addressed. The following will describe how these criteria have been addressed.

The first criterion, *credibility*, can be considered the internal validity of the thesis, meaning that it focuses on the trustworthiness of the data collected (Bell et al., 2019). The first step in ensuring credibility, the study must be done in a way that aligns with good practice, meaning that the data collected from the participants are presented in a correct way (Bell et al., 2019). The participants were chosen based on certain criteria, to ensure that they accurately represented the Swedish automotive industry. Lastly, all the interviews were recorded and transcribed.



*Transferability* on the other hand can be considered as the external validity of the research, and thus it focuses on if the research is applicable in other research contexts as described by Lincoln & Guba (1985). Qualitative research is often conducted with an in-depth focus and is less concerned with broad research, this complicates the transferability of the research, but it does not mean that it should be disregarded (Lincoln & Guba, 1985). This is because the data collected through interviews are often specific to a certain context, and it is thus hard to apply in other contexts. To mitigate the risk, this section has provided information about the selection criteria, information about participants, data collection method, data analysis, etc. This has been done to increase the transferability of the thesis as per Shenton (2004).

The third criterion, *dependability*, refers to the information about the thesis process that is provided (Bell et al., 2019). To ensure dependability, the authors should be transparent about the process. The authors have documented the process to increase dependability because it will increase consistency if the research were to be repeated (Lincoln & Guba 1985). As mentioned, the process of this thesis and the decisions taken is presented in Chapter 3. Furthermore, for the readers to have access to the data used, the interviews were transcribed, and the thematic analysis is presented in Appendix 1.

The last criterion, *confirmability*, is concerned with the authors' objectivity and that they conducted the research without trying to integrate their personal beliefs (Bell et al., 2019). This can be difficult in a qualitative study because the authors interpret the data in their way, which could mean that their biases affect the analysis. This means that a true objective qualitative study is nearly impossible to achieve regardless of the author's intention. The first step was for the authors to acknowledge their biases and try not to let them affect the analysis; this was partly mitigated by doing the analysis together. Another way the authors increased the confirmability was by conducting a thorough literature review and then constructing the interview question based on the literature review.

## **4.0 Empirics**

*In this chapter, data collection from interviews and annual reports are presented. The first sub-chapter will present the secondary data, i.e., the organization's overall sustainability approach and goals collected from each annual and sustainability report. Furthermore, only the most recent report and some of their most recent investments are presented to make their vocal ambitions more clear. The following sub-chapter presents the primary data, i.e., the empirical findings from the interviews, and is presented and structured as the literature review. First, how social, environmental, and economic criteria (TBL) are considered in the functions. Further, we present the impact of regulation and how other external factors influence the companies' sustainability commitment. Second, the use of scenario planning and the impact of uncertainty. Lastly, the decision methods. In the last sub-chapter, the presentation of data is structured in the following way. First, how alternatives are evaluated. Second, the criteria considered by the companies. Third, qualitative data and other measures that are difficult to quantify. Lastly, the barriers to incorporating sustainability criteria.*

### **4.1 Sustainability goals**

In this sub-chapter, a comprehensive overview of the three studied organizations, Volvo Cars, Polestar, and Lynk&Co's sustainability goals are presented. Furthermore, some of their past years' investments to reach these goals are presented. This data aims to provide further insight into the respective organizations' goals and ambitions and to enable a deeper analysis of the primary data.

#### **4.1.1 Volvo Cars sustainability goals and recent investments**

Intending to become a zero-emission car manufacturer, Volvo Cars aim to reach 50 percent of their sales from fully electric vehicles by 2025, and 100 percent by 2030. By 2025, the company aims to mitigate its carbon emissions per average vehicle by 40 percent. In the recent year, Volvo Cars announced that they together with Northvolt will build a battery plant in Gothenburg. This is one of the projects the company makes as a part of their SEK 30 billion investment project in their journey to become a fully electric car manufacturer. Furthermore, the company announced another SEK 10 billion investment to upgrade its

production plant in Gothenburg. This too is a part of the SEK 30 billion investment plan. At the beginning of the second half of 2022, Volvo Cars announced that they will build a new production plant in Slovakia for their electric car models as a part of their growth ambitions. (Volvo Cars ÅR, 2022).

#### **4.1.2 Polestar sustainability goals and recent investments**

In 2020, Polestar presented its sustainability strategy. As climate neutrality, circularity, transparency, and inclusion are the building blocks of this strategy, Polestar aims to create a sustainability culture in its firm. During the spring of 2021, Polestar announced a project called Polestar 0. This initiative is built on the vision to create a climate-neutral car by 2030, all the way through its value chain. Besides this goal, the company aims to reach full climate neutrality by 2040, including its value chain. To reach the firm's long-term and short-term sustainability goals, each department is accountable for putting together one-year climate action plans. In addition to this, Polestar has joined forces with other initiatives, such as the Exponential Roadmap Initiative and UN Initiative Race to Zero. (Polestar SR, 2022)

#### **4.1.3 Lynk & Co sustainability goals and recent investments**

Lynk&Co's most important goals are linked to inclusiveness, diversity, and mitigation of their carbon footprint. The firm breaks down that gender diversity is to be equal, and no differences regarding salaries shall take place. Furthermore, by 2030 they aim to mitigate their carbon emission by 50 percent per car during its lifecycle by only providing fully electric vehicles. By 2040, Lynk&Co aims to reach net-zero emissions. (Lynk&Co, 2023)

### **4.2 TBL**

#### **4.2.1 How the three criteria are considered in the companies**

The triple bottom line as described in sub-chapter 2.1 suggests that for a company to be sustainable, it needs to consider social, environmental, and economic aspects equally. Several respondents mentioned that they do work with all three of those aspects but not in the way TBL describes them. Based on the data collected, in most business functions, the economic and environmental aspects are the focus. Respondent R3 for example mentioned how Volvo

Cars has the environmental aspect of the business as a strategic goal and it is almost imprinted in the company that you must consider it when faced with a decision. As mentioned in sub-chapter 4.1, the companies examined in this thesis all have set challenging goals for themselves, therefore the company must imprint this in the employees. Furthermore, R1 mentions that everything they do at the company must be aligned with their environmental goals. R6 discussed how setting goals and having concrete measures are important in achieving sustainability in all three aspects at a large company.

R7 emphasized the importance of balancing the triple bottom line of economic, social, and environmental factors when making decisions. As a business controller, R7 said that to ensure profitability over a product's lifetime, the company sets financial targets for each component and development phase. This ensures that environmentally innovative ideas from engineers are not only creative but also market-ready and affordable. In terms of social considerations, the company works closely with its suppliers to maintain acceptable standards, such as avoiding child labor. However, there are challenges in maintaining transparency and measuring sustainability goals throughout the entire supply chain. Despite these challenges, the company thoroughly checks all suppliers before signing any contracts.

There was a consensus among the respondents regarding the economic aspect of TBL, they all concluded that it must be considered when faced with a decision, and it is often the main thing that you are constrained to. For example, R3 explained it as you always will have too little money, but you must make the most out of it. R2 argued that some decisions made may be economically unsustainable short term, but the decisions are setting them up for the future where they hope to achieve better profitability. R1 mentioned that the innovation function wants to minimize the environmental footprint of a product, but within a company, you must stick to the budget, meaning that you can not be environmentally sustainable if you do not consider the economic aspect as well.

The last aspect of the TBL receives less attention. As it refers to social sustainability, it was difficult for the respondents to describe how they incorporate it into their decision. Social sustainability is more prevalent in procurement where they must examine the different

suppliers to ensure that they meet the social standards that the companies have set, for example, no child labor, no corruption, etc. On the other hand, R1 from Lynk&Co mentioned that they have two paid days a year where they can participate in charity work and that they have a program in place with Stadsmissionen where they teach young adults that do not have the means to drive. Lynk&Co motivates this by believing it boosts morale among employees and it increases their brand image in the city they're located in according to R1. Volvo Cars had a similar social program in place, in Tynnered, Gothenburg, they wanted to make the area safer and R3 mentioned that when they organized Volvo Ocean Race, they participated in beach clean-ups in the city the boats arrived in. Even though it only costs them money, they believe that it is necessary to increase their brand image.

*“ Are we supposed to spend money on social sustainability endeavors? ... Yes, it helps us in our brand development and it helps us in our business. Although it is terribly difficult to measure the effects of it, it may be showing who we are and what we stand for” – R3*

Several respondents mentioned how it is difficult to balance these aspects, and compromises must be made to succeed as a company.

*“ When faced with a decision, you first consider the economic and environmental aspects because it will matter most in the end”. – R5*

#### **4.2.2 How regulations and other external factors have affected the companies' commitment**

There is no hiding that stakeholder engagement has influenced companies, but in terms of sustainability commitment, it is less clear. Most of the respondents said that government regulations and EU directives influence the decisions made. R2 said that the EU directive stating that automotive manufacturers can only sell electric vehicles (EVs) by 2035 has sped up their transition to EVs, as Volvo Cars have committed to only selling EVs by 2030.

Furthermore, several respondents said that government incentives affect the speed of adoption, thus affecting decision-making. For example, Norway has been at the forefront of

the adoption of EVs because of its incentive program according to R2. A country like Turkey, on the other hand, that does not have the incentives in place, nor the charging infrastructure needed to make the transition to EVs will result in the decision-making regarding sustainability more difficult according to R2.

*“The tax incentives, charging infrastructure, and the fact there are lanes solely for EVs make EV ownership in Norway easy, but in Turkey, who is comparatively lacking, EV ownership is very difficult. Therefore the speed of adoption is slow” – R2*

R5 mentioned that the risk of tariffs will affect decision-making as well, for example, the trade war between China and USA will affect where they place factories and suppliers.

## **4.3 Scenario Planning**

### **4.3.1 The use of Scenario Planning**

The consensus among the respondents regarding the use of scenario planning was that it is a tool/method that the organization uses, but that it differs between departments. However, the innovation manager at Lynk & Co (R1) answered that their department did not use it, with the motivation of its size and shorter time horizon which was mainly in-between three to six months. According to R8, scenario planning was very commonly used, and when building scenarios, it is important to calculate their probability of occurrence. The respondents that work within the field of finance (R4, R5, R7) explained that business cases are done regularly to examine and challenge the different options. In these business cases, models for future profitability are created and are explained to be in more detail the nearer in time it is calculated and as farther ahead it is, the more assumptions are made. R6 from risk management explained that climate-related risks are subjects for both the present and the future.

*“We try to have some sort of five-year perspective, and when it comes to climate risks we have to look further ahead” - R6*

The controller R5 explained that talking to customers and having internal and external discussions with regions allows for more informed assumptions. Further, the business cases are then stress tested for multiple things, including changes in currencies and tariffs among others.

All respondents that use some sort of corporate foresight said that being agile is key and that regular follow-ups are done, approximately two times a year. R5 said;

*“If new US tariffs are imposed, we do an analysis of its effects on us immediately – R5*

The country manager R2 explained that they mostly plan for the next seven years and that regular follow-ups are made, but that the length of the plans differs. R2, R3, and R8 said that trend spotting is of great importance when monitoring for the future, and that this type of long-term analysis can extend as far as 20 years into the future.

R8 explained that trends move in cycles, and exemplified with autonomous driving and electric vehicles. The first of which, autonomous cars, has been a fluctuating trend that has been a scenario for long, but hasn't been as clear nor as fast-moving as the transition to EVs. The same respondent further explained that they have innovation hubs that are, among other things, working on identifying what the next thing can be in the coming 10 to 20 years. These innovation hubs focus on the broader picture (explained as scenarios) for the next 10 to 20 years. But they are also explained to focus narrowly and short-term. The closer something is in time, the more specific it becomes according to R8.

Furthermore, the respondents who used scenario planning mentioned that the product life cycle is a process in which scenario planning plays a role, and that as being agile is a prerequisite for success, it is difficult to make any larger changes when the production has started.

### 4.3.2 The impact of uncertainty

Among all respondents, uncertainty is a fact and can be challenging, but it must be dealt with and calculated. The uncertainty was brought up to be one of the reasons for planning and using tools such as scenario planning. The respondents explained that uncertainty is the reason for building strategies, business cases, and plans. Business controller R4 explained that uncertainties make them risk-averse and emphasized the importance of spreading risks to be better prepared, with the example of not being too exposed to one certain region.

*“Everyone has come to realize how difficult it is to actually plan. As recent years of turbulence have shaken us all, we must reconsider our exposure to certain things as the volatility can hit us hard” – R4*

Further, the respondent said that this creates a discussion of what the price is related to the risk and thus can decide if the risk is worth mitigating. Being agile is brought up by the respondents as an important factor when dealing with risks. R3, a former senior VP said that it is important to have the courage to make decisions even though there are uncertainties.

*“We can't evaluate and plan until we die. We have to make a decision at some point, and of course, that may not be the best one. You must not be a coward in your decision-making. It's better to take a decision than just dwell on things” – R3*

According to R8, uncertainty is present constantly and thus amplifies the importance of substantiating decisions and scenarios with both data and forecasting. Being flexible is key, the respondent said. All of the respondents acknowledged the recent years of turbulence in terms of semiconductor shortage, the invasion of Ukraine, and issues related to raw materials have impacted their way of preparing and planning for the future. R7 and R8 said that the problem does not lay in the uncertainties, they know about, but rather in the uncertainties they are not aware of. Furthermore, R8 said that by writing a white book after a project, they can learn from their mistakes and mitigate the chances of repeating what went wrong. They called it “being a learning organization”. Furthermore, according to R8, the recent years’ turbulence has caused the firm to be more cautious and test the scenarios more.



## 4.4 Decision-methods

### 4.4.1 Evaluating alternatives

Many of the respondents mentioned that there are a lot of criteria that need to be considered before making a decision. To structure the information, they use different standardized methods. However, due to it being business critical, all the respondents could not share the exact details of the methods but some of them provided some insights of how their process works.

For example, functions involved in a decision could be finance, production, procurement, sustainability, etc., where the functions collect data regarding the project and synthesize the information. It is then compiled and overseen by the project manager and a final decision is made according to R5. The finance functions do different business cases to see how different factors influence the outcome, they then compare the cases to the present according to R5. Following this, R5 said that the decision-making process is initiated by defining the objective of the process, which is then deconstructed into smaller sub-goals. The sub-goals are then allocated to the business function responsible, who is tasked with executing them. Following this approach ensures that the necessary factors have been considered adequately according to R5.

*“A decision is taken by a single project manager; different business functions collect information to present to the project manager who then decides.” – R5*

R3, a former VP at Volvo Cars, did not mention any specific method they use, instead, they have internal processes and methods. These processes are optimized year after year by a team that is tasked with improving Volvo's processes. The respondent further mentioned that they use a method in line with an LCA in certain situations where they evaluate the environmental impact a product has over its lifetime.

R1, an innovation manager at Lynk&Co, mentioned that they worked with a standardized method. According to R1, they use an evaluation matrix to choose the optimal product based

on several criteria which they rate on a scale of one to ten, where 1 is optimal and 10 is not feasible. They look at criteria such as feasibility, coolness, customer benefit, PR value, revenue, attract and retain, cost, and sustainability. After scoring each alternative in this matrix, it is then compiled and Lynk&Co will have a more objective understanding according to R1. The ultimate goal with all of this is to decide whether to move forward with a project or not according to R1.

Like R1, Risk Manager R6 said that they evaluate the risk of different alternatives by using a matrix where they score each risk criterion by a combination of the probability of it happening and the outcome of it. When it comes to a big decision, they try to break it down into smaller, more manageable parts, which allows them to divide the evaluation between different functions. R6 further mentioned that they have different risk scales for different criteria, which means that they will evaluate the risk of the safety criteria differently than the environmental criteria. However, according to R6, it is difficult from a risk management perspective as it is difficult to understand the impact of each part without the context. To mitigate this risk, they continually improve their methods and processes according to R6, which was also mentioned by R3. By breaking it down into more manageable parts, they can effectively evaluate different parts of different alternatives and by continuously improving their methods they can optimize them in the long run according to R6.

Respondents R5 and R7 had different points of view. Both are in the finance department, R5 at Volvo Cars and R7 at Polestar. Instead of using a decision-making method, they construct business cases to see how profitable an alternative is and thus they can have a comprehensive understanding of each alternative. The result of this is more informed decisions according to R5, moreover, it can help them identify costly mistakes and ensure that all the alternatives have been thoroughly vetted.

*"When we are faced with alternatives, we make business cases to look at which one is the most profitable. Of course, there are other aspects of a decision that means that we may still not choose the most financially lucrative alternative. Because there are aspects that provide a great advantage that we cannot put a financial value on. – R7*

Most of the respondents mentioned that they do usually have rather strict methods for choosing a supplier. Because they cannot control them in the same way, they need a standardized way to choose, to minimize the risk that the supplier does not fulfill their requirements. Furthermore, R3 mentioned that Volvo Cars have different methods for different situations.

#### **4.4.2 Criteria considered by the companies**

As mentioned, R1 brought up the criteria Lynk&Co innovation department uses when they are faced with a decision. Their evaluation matrix uses the criteria feasibility, coolness, customer benefit, PR value, revenue, attract and retain, cost, and sustainability. R1 highlighted that the PR value of a decision is important because it will attract new customers as well as retain old ones who can identify with the brand. This was further mentioned by R6, R7, and R8 who said that some decisions include criteria such as media attention, meaning that they will hypothesize how much positive or negative press the alternative will have. By using these, they can prioritize their different alternatives and see which one will come out on top according to R1. Although every criterion does not weigh the same in terms of importance, R1 said the following about the most important criteria.

*“I cannot think of any product where we would have prioritized anything financial over the sustainability aspect ... it is non-negotiable in our organization.” – R1*

Both R3 and R8 mentioned the importance of the sustainability criteria, but they highlighted it partly because of the clear vision towards becoming sustainable but also because it is where the regulations lie. There are rules on how much a car is allowed to emit, and companies must do all they can to adhere to those rules. Another thing they both mentioned as the most important criterion is safety. Since their decisions are mostly regarding the car itself or its components, they cannot compromise on safety. The safety criterion also has a lot of regulations that automotive manufacturers must follow. R8 said that safety is one of the most important because it is what the brand is, the company wants to be regarded as one of the safest automotive brands in the world and if they were to disregard it in favor of profitability

for example, it would have devastating effects on the brand. To sum up their reasoning R3 said:

*“You can waiver on a lot of different criteria, but Volvo will not compromise when it comes to the safety criterion nor the sustainability criterion” –R3*

Furthermore, R3 also highlighted that the criteria that Volvo Cars uses stem from its core values. The decisions that they make must be aligned with the values because that is what the customers expect from them and deviating from that could be detrimental to the brand and the sales according to R3.

The respondents in the finance function of the business mentioned different criteria when they evaluate alternatives. R5 mentioned that when they construct their business case, they tend to focus on the margins of each car and identify the ones most profitable. They will try to identify the most “sellable” car because the automotive industry is a low-margin industry and for economic sustainability, they must prioritize the cars they will sell the most even though it might require a compromise elsewhere according to R5. R7 highlighted that as a business controller, you must be real in the R&D to not spend too much money as companies do not have unlimited funds, but at the same time, you must find the balance between becoming economically sustainable and environmentally sustainable because Polestar is a company headed in a certain direction. Furthermore, as an innovative company, they have to consider technical development as well.

In the risk management department, they use criteria such as finance, business interruption, safety, brand, social, and environmental. For example, they use CO2 emission as a way of evaluating the environmental criteria according to R6. They then score each criterion a number between one and eight where eight means that the alternative is scratched immediately. From R6’s perspective, the safety criterion is the most important one, because, from a risk management perspective, safety is the criterion that could cause the most damage to the company if not prioritized. However, there is a lot that goes into evaluating the risk according to R6, where there are different criteria for every project and the risk evaluation will differ as well.

*“Safety is one of our most important features, and it triumphs the economic criteria. If we do not live up to our safety standards, it will have devastating effects on Volvo as a brand. For this, we have a scale of one to eight, where an eight is the worst” – R6*

A concrete example mentioned by a few of the respondents was the production plant Volvo Cars is building in Slovakia. They said that several criteria were considered in the decision to place the plant there such as logistics, environmental impact, social impact (in terms of workers), human capital, cost, regulations, subventions, cost, etc. R4 mentioned that logically they would place the plant in a country with a strong automotive tradition thus finding the human capital is easier. Both R4 and R5 said that EU subvention and the partnership with the Slovakian city (among other things) led to it being chosen. When decisions are larger they tend to involve more criteria and take longer time to evaluate, but that is the nature of the large decision, you need to consider a lot of criteria and do your due diligence to ensure that the alternative chosen is the best one objectively according to R4.

Most of the respondents highlighted that there are many different criteria to consider and that the situation will determine which criterion will be most important. Furthermore, they also mentioned that the criteria will change depending on the project. In the end, the alternative that will cost the company the least will often be prioritized. As mentioned by several respondents, all companies are restricted by the amount of money they have and they must spend the money efficiently, although the alternative must always fulfill the basic requirements that they have. The respondents highlighted that they experience difficulties with weighing the criteria against each other. Almost everything conflicts with each other. Whether it is economic or environmental as mentioned it could also be between brand image and safety. This forces them to have to prioritize criteria to then compromise on some of them. Different departments will prioritize differently, but it is most important that the core values of the company are represented in the alternative chosen according to R8.

Few of the respondents, however, highlighted the importance of the social criteria. R2 mentioned that the social criterion (no child labor, no corruption, etc.) is incorporated in the contracts they have with their supplier and retailers, and if they were to breach it, Volvo Cars

would terminate the contract. Others mentioned that the social criterion is taken almost by default, they assume the alternative they evaluate reaches the requirements needed. They further mentioned that the procurement function conducts extensive due diligence on their suppliers, including visiting the mines where they get their metals from. They do all this to ensure that suppliers in developing countries are socially sustainable.

<b>Functions</b>				
<b>Criteria</b>	<b>Finance</b>	<b>Management</b>	<b>Risk</b>	<b>Innovation</b>
Environment	✓	✓	✓	✓
Economic	✓	✓	✓	✓
Brand image			✓	
Safety		✓	✓	
Social				✓

*Table 4. The most common criteria considered by the different functions / most important criteria in the respective function.*

#### **4.4.3 Qualitative data and its challenges**

When asked about how they evaluate and measure qualitative data and the difficulties with it, the respondents brought up, among other things, brand reputation, the real climate effect, and understanding the customers' needs and expectations. The respondents from Volvo Cars explained that work is being done to create a stronger connection and relationship between the firm and the end customer. This was said to be a step in their mission to increase their insight into what their customers think and need. R2 said that as sustainability has grown to become both more important and prevalent over time, as new types of data are available, it can still be difficult to know if enough has been collected.

R1 and R3 expressed the gut feeling to be a tool when it becomes difficult to measure, but that some sort of number, either by estimating or using scales should be alongside this factor when decisions are taken. R3 said that they have a scale from 1-10 when the matter becomes

too subjective. R8 mentioned that qualitative measures such as brand image have the potential to affect the reputation of the firm and that that can cause damage – thus it is important for them to in the best way possible work with understanding soft data better. Both R5 and R8 mentioned that they have a separate division called Market Intelligence which is set out to spot trends and increase their understanding of customer needs.

Further, respondents working at Volvo Cars said that one of their most important core values, safety, is in some ways measured in qualitative ways. Where R4 mentioned that as the safety perspective is their most important, it also carries the highest risk. Moreover, R5 said that political developments, regulatory decisions, and other market-impacting events are difficult to measure. According to one of the respondents working at Volvo Cars, when it is difficult to measure the effects of something, they evaluate the risk from medium to low.

#### **4.4.4 Barriers to incorporate the sustainability criteria**

Respondents mentioned several barriers when trying to include sustainability in their decision-making process. R3 highlighted that one of the key challenges is the conflict between political correctness and practical considerations. R3 noted that people often prioritize sustainability initiatives that are popular or politically correct, rather than considering practicality and energy efficiency. An example given by R3 was that in the German chemical industry, respondents noted that recycling plastic was found to be uneconomical, and burning it for energy was a better option but it was not viewed as environmentally sustainable according to R3. The respondent further mentioned the importance of considering practicality and energy usage when incorporating sustainability should not be underestimated because otherwise, the company could suffer.

R8 mentioned the need to incorporate sustainability into daily work, not just leave it to a sustainability department. R8 emphasized that sustainability needs to be present all the time, much like safety, and that the challenge is to maintain a sustainable focus despite everyday difficulties. When making choices, one should consider not only price and technology but also sustainability and stability from an external perspective according to R8.

R6 and R7 further mentioned that the cost or profitability of sustainability can be viewed as a barrier. While it can be difficult to put a price on sustainability, the respondents noted the importance of considering both the pros and cons of sustainable practices and trying to quantify their impact. One approach suggested by R7 to counter the difficulties was scenario planning and sensitivity analysis, which involves considering different possible futures and their potential impact on the business, including in terms of sustainability. This approach, while not guaranteed, can help companies identify the potential benefits of investing in sustainable practices and find ways to quantify them according to R7. Furthermore, by quantifying the effects of incorporating sustainability, it could potentially be easier to market and persuade stakeholders that the product is sustainable according to R7.

Finally, risk manager R6 noted the subjective nature of defining sustainability and ESG risks, which can lead to disagreements within a company about what risks are important to prioritize. While concrete examples of biodiversity preservation were provided by R6, such as compensating for the loss of wetlands during the construction of a factory, there are still challenges in valuing and prioritizing different sustainability and ESG issues in the decision-making process.



## 5.0 Analysis

*This chapter undertakes an analysis of both primary and secondary data utilizing relevant theories derived from the literature review. It is organized into three distinct sub-chapter, namely, RQ1, RQ2, and RQ3, to facilitate a comprehensive and systematic examination aimed at addressing the research questions in a cogent manner. Furthermore, given the objective of identifying possible disparities across functions within the industry, the analysis is structured to address the research questions from a functional perspective, thereby providing a more nuanced understanding of the phenomena under investigation.*

The research questions were structured as follows. RQ1 aimed to capture the sustainability criteria that the different functions use and how they may differ between the functions, and how they are implemented/included in the decision-making. Then, RQ2 focused on what the challenges may be when considering these sustainability criteria. Lastly, RQ3 aimed to investigate to which extent the futuristic technique of scenario planning is used to prepare for sustainability challenges and as a potential tool to make more informed decisions

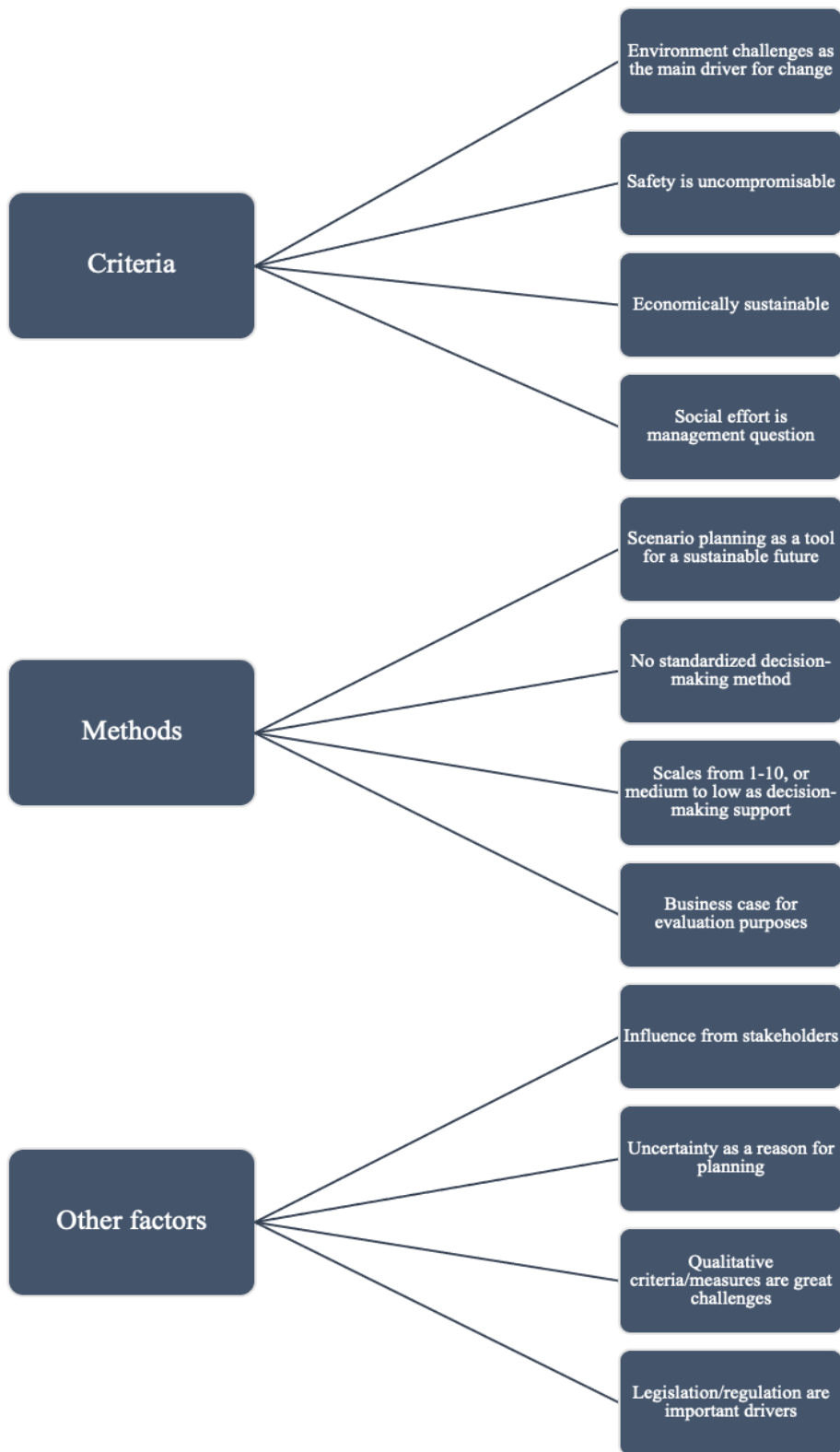
**RQ1:** How does the Swedish automotive industry include sustainability criteria in its decision-making?

- And does it differ between business functions?

**RQ2:** What are the most prominent challenges when considering sustainability in the decision-making process?

**RQ3:** To what extent do decision-makers in the Swedish automotive industry use corporate foresight to prepare for future sustainability challenges and opportunities?

With the purpose to identify differences between business functions and the inclusion of sustainability criteria, the objective of the coding was to identify the themes in the respondents' answers. Subsequently, each theme was assigned a color and thus enables an illustration of what categories each respondent brought up.



*Figure 5. A visualization of the thematic coding.*

Figure 5 provides a first glint of the identified themes from the interviews. The figure illustrates the main themes circulated around criteria, different methods, and other factors. The right row of the figure demonstrates the identified themes that were observed throughout the interviews.

## **5.1 The inclusion of sustainability criteria into the decision-making, and the differences between functions**

In this sub-chapter, an analysis of the respondents' answers regarding social, environmental, and economic criteria is presented. To answer how the Swedish automotive industry includes sustainability criteria in their decision-making, the analysis builds upon the theoretical idea that for a company to be sustainable, it must consider all three criteria.

### **5.1.1 How sustainability is viewed**

The view on the triple bottom line and its components differed among respondents. Some of them had heard about the concept, but the knowledge of it was minimal. TBL, however, is a general framework with dimensions that the companies in this study incorporate into their strategy. The two dimensions most frequently mentioned were the economic and the environmental aspects, which are natural as they are the most prominent in the current business climate. The social aspect of the business however does not receive as much attention, it instead was viewed as an issue for top management where it is incorporated in the long-term strategy of the company. Several of the respondents also mentioned that the procurement function works a lot with the social dimension of TBL. For example, they visit the mines they receive their metal from. A possible reason why the social aspect is not incorporated to the same extent as the other two could be because it is not the respondents' responsibility to consider it in the decision-making process. They need to focus on the dimensions that affect their function the most. Some of the respondents also mentioned that the social dimension of the business is difficult to measure, meaning it is difficult to know what works and where more effort should be aimed (Mardani et al., 2015; Chang, 1996). From a decision-making perspective, companies need to allocate their resources efficiently. The lack of knowledge about the potential impact of including social sustainability may cause decision-makers to neglect the criterion further. The use of fuzzy numbers which quantifies

qualitative data (Calabrese et al., 2019) may increase the importance and ease the incorporation of the social dimension and therefore become more prioritized in decision-making.

In this study, some of the respondents were business controllers, and they mentioned that they use goals and concrete measures to achieve economic sustainability. For example, Polestar sets financial targets for the different phases in their R&D department to ensure the product's profitability (Elkington, 1997). Volvo Cars have a similar approach to how they try to be economically sustainable long term. In line with Stoycheva et al. (2018), Volvo Cars' finance function mentioned that they use financial measures such as return on investment and profitability. They do this to have concrete data on key measures, in that way, they can monitor how certain interventions affect their business, this also allows them to see where they need to improve, which can aid in their quest to become economically sustainable long-term.

Regarding the environmental aspect, all the respondents were knowledgeable about their companies' environmental goals. They highlighted the importance of making the transition to become a sustainable company, where they all wanted to be climate neutral by 2040 (Lynk&Co, 2023; Polestar SR, 2022; Volvo Cars ÅR, 2022). To do this, they need to identify the areas of their value chain that have the most environmental impact, and therefore require improvements. This necessitates the ability to measure their current impact (Elkington, 1997). This may lead to companies pinpointing where their environmental footprint is the largest and implementing sustainable practices thus reducing the environmental impact they have. The lack of available tools/methods for measuring the footprint could be a reason why it was found to be difficult for some companies according to a respondent. In line with Alhaddi (2015), the respondents found that it is difficult to assign value to certain environmental and social aspects, and it was even described that there are entire teams dedicated to calculating the responding financial value certain aspects have. Furthermore, the respondents found it difficult to balance these factors, especially the financial and economic factors (Alhaddi, 2015; Jamali, 2006).

To summarize how the three lines of TBL have been considered in the study, it is clear that the environmental and the economic line is by far the most important ones. As mentioned, this is due to several reasons but the main one may be because all the respondents do not work with anything that is related to social sustainability, while environmental sustainability has become part of their everyday work. Economic sustainability is needed in every company that wants to survive long term so logically it is considered often. However, for a company to be considered sustainable according to Elkington (1997), it needs to consider all three lines equally and according to the data may be an area of improvement for the companies.

### **5.1.2 Decision Methods**

It was found that several different decision-making methods were used. The respondents did not mention a specific method that they use, instead, they referred to internal processes, business case simulations, scenario planning, and evaluation matrixes. Two of the respondents kept referring to the internal processes that are enhanced year after year but did not go into detail about how it works. One respondent said that they do risk assessments on projects they undertake, where they rank each alternative in terms of risk. To evaluate the product's impact on the environment, one respondent mentioned that they evaluate the impact a product has on stakeholders over its lifetime with emphasis on the importance of calculating each product's impact on the environment (Nordelöf et al., 2014). As the automotive industry's biggest impact on the environment happens after the purchase, i.e., fuel consumption (Bergbaum et al, 2021), Volvo Cars' life cycle analysis may have been a factor in their commitment to only selling EVs by 2030 (Volvo Cars ÅR, 2022), which will lower the emissions from their cars after the purchase.

A common thing mentioned by the respondents was that they often start by outlining the goal of the project, then divide the goal into sub-goals that are delegated to a business function. The function will then examine the sub-goal and collect information regarding it. This allows them to get a better understanding of how different parts affect the end goal and is an effective way of delegating the work. Although the connection is weak, this method of breaking the goal into smaller sub-goals can be compared to an MCDA method, such as the AHP (Saaty, 1981).

Some of the methods mentioned, incorporated several criteria, employing numeric values to facilitate the comparison of alternatives to then be able to prioritize (Stoycheva et al., 2018; Saaty, 1981). Though it was not clear whether they used the value or score to evaluate the alternatives like the MAVT or the AHP. It seemed that it was used to determine if an alternative had any criteria that were below the accepted level. For example, in the risk department, if an alternative scored an eight on their scale, they would not go ahead with that alternative as it would likely damage the company. Therefore, it cannot be concluded that they use a decision-making method that structures the criterion as described by Saaty (1981), nor did they assign weights to each criterion to determine the best alternative based on their perspective. Although, one can argue that the idea of the AHP method and scoring each criterion a value based on importance/risk are similar. The respondents in the finance department use business cases to determine how the profitability deviates in future scenarios. By doing that, they get an understanding of the economic consequences of an alternative.

### **5.1.3 Decision-making based on criteria**

In the literature, the MCDA methods mentioned use multiple criteria to evaluate and rank different alternatives. Therefore, in theory, it should not be difficult to include criteria related to sustainability. Since there are multiple cases where MCDA methods were successfully used in the decision-making at automotive companies (Cinelli et al, 2014; Oliveria et al, 2013; Mardani et al, 2015; Putra et al, 2020), the automotive companies studied could arguably implement a method like it. However, it could be difficult at a company like Volvo Cars, which has existed for nearly 100 years where internal processes dominate. It could be argued that implementing a decision-making method that includes environmental sustainability criteria in the evaluation could be beneficial for Volvo Cars because to reach their goals (Volvo Cars ÅR, 2022) they need to prioritize it throughout the entire supply chain.

Some respondents argued that for their company to survive they need to prioritize environmental sustainability most, this was mostly from the perspective of top management. Although the respondents in the finance function highlighted the importance of the environmental sustainability criteria, they were more concerned with the economic criteria and focused on the fact that the products they sell must reach a certain profitability level. To

maintain sustainability across all dimensions, implementing an MCDA method could result in a more objective evaluation of the alternatives, where the criteria prioritized by the company would receive more weight (Stoycheva et al., 2018). It should be mentioned that the implementation of a new decision method will require time and investments, which could deter a large company, and conducting an MCDA is also time-consuming which could be seen negatively by companies (Cinelli et al., 2014).

In the innovation department, which was smaller by comparison to the others, it could be implemented with less effect on the overall performance of the company. They already use a method where they evaluate each alternative based on the score it receives on a pre-determined set of criteria. It was mentioned that the selection of material was important, and thus MCDAs such as the FAHP may be helpful (Ahmed Ali et al., 2015). By doing this, they receive an objective understanding of which alternative is the best. In this function, the environmental sustainability criteria received a lot of attention already so it could be argued that implementing a new method is redundant.

#### **5.1.4 Criteria prioritized by companies**

As mentioned above, the respondents mentioned that the environmental criteria receive a lot of attention, but it is not always prioritized over other criteria. The study found that criteria such as safety, economic, and environmental sustainability are all prioritized because of different reasons.

The respondents agreed that when considering an alternative, there are a lot of different criteria that need to be incorporated into a decision. They further agreed that the criteria change depending on which project is undertaken. This may make it difficult to standardize a decision-making process and it makes it difficult to know how to prioritize the criteria. As mentioned, it was also found that the respondents found it difficult to measure certain environmental criteria (Chang, 1996; Mardani et al., 2015), as one respondent mentioned, while certain sustainability measures are relatively new, regular accounting has a long history. Some respondents further acknowledged that measuring qualitative criteria is difficult because it requires a subjective opinion which may result in a compromised decision

(Calabrese et al., 2019). An LCA could be used to increase the knowledge of how an alternative impacts the environment over its lifetime (Nordelöf et al., 2014). Only one respondent mentioned that they use LCAs as a tool to evaluate the impact of an alternative, so implementing it would require time and education for the employees. Companies need to be able to measure certain criteria accurately so the information can be passed to the decision-maker, who then can take a well-informed decision (Chan et al., 2015).

The most frequently used criteria were safety, environmental, economic, social, and brand value. Safety was considered by many to be the most important criterion because of the effect it could have on the company if it was not prioritized and one respondent even highlighted that they cannot compromise on safety. In the literature, the safety criterion was not featured, although this may be because previous studies had a different focus.

The environmental criterion was also important according to the respondents, partly because there are rules and regulations around but also because the companies in this thesis have positioned themselves in a way that it must be prioritized in order to reach their goals (Ghadimi et al., 2000; Oliveira et al., 2013; Stoycheva et al., 2018). The study found that every function interviewed has incorporated the environmental criterion, albeit some to a lesser extent. Unsurprisingly, the business controllers highlighted the importance of the economic criteria (Putra et al., 2021). This is because companies need to sustain a certain level of profitability to survive, they cannot disregard it, even though it was mentioned that they accept that they will be lower during the transition to EVs, it needs to be increased in the future for the company to survive long term. Other criteria mentioned such as PR and brand value, were not brought by the literature, this could be because previous literature had a different focus. Both top management and the risk function highlighted the importance of safety and brand image, both functions know the effects it can have on the company if an accident happens, therefore, it must be prioritized ahead of other criteria.



## **5.2 The most prominent challenges when considering sustainability in the decision-making process**

The following sub-chapter aims to analyze the most prominent challenges that the respondents expressed when considering sustainability in the decision-making process in relation to the literature.

### **5.2.1 Qualitative data and challenges**

The automotive industry has been under pressure to become more sustainable and the company in this study has committed to ambitious sustainability goals. However, the path to becoming more sustainable is not easy and this study found some challenges that they face.

The challenge mentioned most by the respondents was the difficulties in measuring the qualitative sustainability criteria. Traditional criteria such as the economic one have been measured for centuries while sustainability criteria have received more attention recently and may be qualitative and are therefore difficult to measure. This becomes a challenge for companies as they cannot accurately measure important criteria (Calabrese et al., 2019) because they cannot measure the impact certain criteria has on the business or the profitability it might have. Instead, companies rely on the subjective opinion of experts (Mardani et al., 2015) which can be problematic in a big decision-making process. When dealing with complex decisions, most companies want to receive objective information so that they can make a well-informed and optimal decision. A suggestion by Chang (1996) is to incorporate fuzzy numbers. Using fuzzy numbers, allows companies to measure qualitative data quantitatively (Calabrese et al., 2019), thus it is a good way to deal with the uncertainty that many sustainability criteria cause. Although it should be mentioned that fuzzy numbers may not be the most accurate way of measuring sustainability criteria, it can be a solution until further progress has been made.

Other challenges mentioned by a respondent were the pressure they have been under to include sustainability criteria in the decision-making. This has led to companies including it

while not knowing why or how to do it efficiently. There may be a conflict because a company cannot include sustainability criteria without considering the practicality or the feasibility of it. For a company to successfully include it, it needs to fit with the company's current operations and strategy, at least to some extent.

Another challenge was knowing if enough has been done and if more data could have been collected. Considering sustainability in decision-making appears to be something obvious. However, the main challenges seem to be the appropriate response to it (Milliken (1987)). As their long-term goals speak for sustainability to be at the forefront of the company (Lynk&Co 2023; Polestar SR, 2022; Volvo Cars ÅR, 2022), the short-term steps to reach these goals may put spanners in the works. As per the complexity of their value chains and the vital role their suppliers possess, the sustainability efforts appear to be pushed out of their control. Even though there seems to be no shortage of sustainability criteria and their impact on the decision process, the challenges with implementing them are arguably to which extent, and in whose control.

### **5.3 The use of corporate foresight**

To answer the third and last research question, this sub-chapter aims to analyze to which extent the respondents use scenario planning as a tool to prepare for the future. How scenario planning is used among the respondents is analyzed and presented in the first sub-chapter. Then, an analysis of the impact of uncertainty and how it is dealt with in regard to scenario planning and sustainability is presented.

#### **5.3.1 Facilitate decision-making through scenario planning**

As the automotive industry is argued to be one of the industries that are and will undergo one of the greater transformations in the coming years (Vecchiato et al., 2019), the respondents' joint view of the changing environment and new innovative solutions that can change the conditions for tomorrow reconciled. While scenario planning was a tool used by all but one, which could be explained by the respondents' level of position and period of employment, there was a large discrepancy in its use, in terms of level, detail, and time frame. As explained

in the literature review, managers at firms such as Volvo Cars are encouraged to use future-oriented techniques, e.g., scenario planning, to better deal with environmental changes and potentially ease decision-making further ahead (Vecchiato et al., 2019; Vecchiato, 2015). Although not all respondents were managers, the managers' role and responsibility in scenario planning were brought up by both R5 and R8. The answers from the respondents with insight into scenario planning indicate that the technique is not run nor controlled by one group, but rather decentralized with input and responsibility divided between the functions.

Most of the answers received around scenario planning came from respondents working at Volvo Cars. The types of scenario planning brought up in the literature could all be identified in the respondents' views and answers, i.e., the normative scenario planning, probabilistic scenarios, and the Oxford approach (Milliken, 1987). The normative approach captures the idea of what the future will look like. Here, all three organizations aim to only sell electric vehicles, i.e., the future will be electric. Building best and worst-case scenarios, i.e., probabilistic scenarios, were also identified repeatedly, e.g., through business cases. Respondent R6 from the risk-management team discussed how both are used to mitigate risk, as the respondents within finance mentioned business cases to be tools for mainly best-case scenario building. Lastly, through the Oxford approach, i.e., capturing the plausibility of the scenario. As many of the respondents mentioned that uncertainty is part of why scenario planning is a method they use, only R8 mentioned that they calculate the scenarios' plausibility. As risk assessments were repeatedly mentioned, one can assume that plausibility calculations are more widely spread.

In line with the literature (Vecchiato, 2015), the respondents found future-oriented techniques, such as scenario planning, to be valuable as the industry is undergoing transformation and turbulence is causing volatility in the markets. The continuous follow-up of scenarios (Schoemaker, 1995; O'Brien, 2004) was mentioned by the respondents to be an important component for both tackling uncertainty and making more informed decisions. Identifying trends and uncertainties were both of great interest according to the respondents. The importance of trend spotting (Schoemaker, 1995) was demonstrated by R3 and R8 where both stressed that it can extend as far as 20 years into the future, and with support from R5,

separate divisions are set out to identify, among other things, trends, customer insight, and other market-related topics.

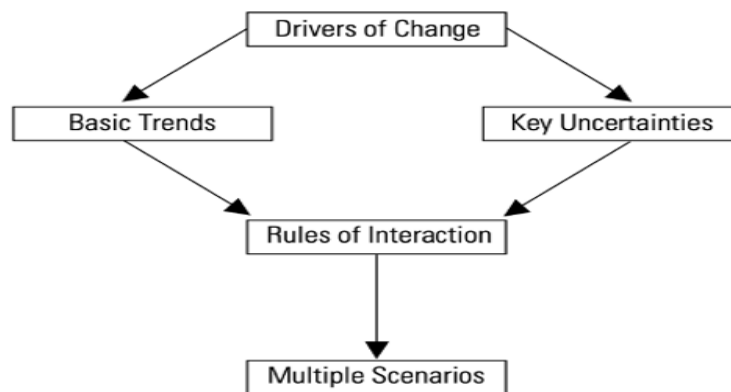
1	Define the scope
2	Identify the major Stakeholders
3	Identify basic trends
4	Identify key uncertainties
5	Construct initial scenario themes
6	Check for consistency and plausibility
7	Develop learning scenarios
8	Identify research needs
9	Develop quantitative models
10	Evolve toward decision scenarios

**Table 1.** *The process for developing scenarios by Schoemaker (1995).*

The process for developing scenarios according to Schoemaker (1995) will be somewhat difficult to align with the respondents' view on the process. The process itself was described to include more than one department within the company and none of the respondents mentioned any standardized model for developing scenarios, as one could interpret Schoemakers' (1995) process. However, if we see the steps as a framework that does not need to be followed blindly, some steps were mentioned more frequently. First, identifying trends. This is as previously mentioned an important factor according to R3 and R8, where it can extend as far as 20 years into the future. Here, R8 mentioned EVs and self-driving cars as major trends. The latter, self-driving cars, was brought up by Vecchiato et al. (2019) to be one

of the greater changes in the industry. However, self-driving cars are according to R8 a trend that fluctuates and has not moved as fast as other trends, such as EVs. Second, plausibility. This was mentioned by R8 to be important factors as scenarios are built, and by others when calculating the risk concerning cost. Third, quantitative models. Here, the business cases could be argued to represent the development of quantitative models. Because of the continuous follow-up and case calculations in business cases, it is reasonable to believe that it acts as the basis of the quantitative follow-ups that are done along the way.

The building blocks for scenarios presented by Schoemaker (1995) apply to the views of the respondents. The trends are as discussed by both the respondents and Schoemaker to be crucial for better preparing and understanding what can come, and the direction of the future.



*Figure 3. Building blocks for Scenarios. Schoemaker (1995)*

### 5.3.2 Uncertainty as a driving factor

Uncertainties were expressed by the respondents as something inevitable, and in the literature as a prominent challenge (Vecchiato et al., 2019). As the uncertainty becomes higher, there is a need for more specific data (Dwirandra & Astika, 2020). However, the respondents mentioned that it can be difficult to measure the exact environmental impact and some other qualitative data. Hence, as environment and sustainability is a topic with many uncertainties, and can be difficult to measure according to the respondents, further uncertainties could emerge from the already existing while trying to collect even more. Of the three uncertainties,

state, effect, and response (Milliken, 1987), state uncertainty covers the difficulty in understanding the drivers of change over time. However, this did not appear to be as emerging as the others. Hence, the industry is arguably facing the uncertainty of the effect and response the most, where the impact on the company is uncertain and what the appropriate response to it may be.

A clear theme could be identified in the respondents' answers. With the high ambitions and sustainability goals the companies present (Lynk&Co 2023; Polestar SR, 2022; Volvo Cars ÅR, 2022), the pressure on suppliers naturally increases. The supplier's role in the companies' mission to net zero emission was a recurring subject of the respondents, where their commitment to delivering sustainable solutions and joining the Swedish automotive firms' goals determines if they are appropriate suppliers. As transforming an industry eventually requires change throughout the whole value chain (Vecchiato et al., 2019), the pressure and expectations were clear to be continued down the value chain. In line with Vecchiato et al. (2019), it was mentioned by the respondents that customer insight, feedback, and relationship has gained increased attention in recent years. As this always has been important, the respondents explained that a closer relationship with the end-customer is desirable. Arguably, this is both a way to strengthen the loyalty to the brand, but also a step towards an increased understanding of the first uncertainty presented by Milliken (1987), by getting closer to the customer, one can better understand the drivers of change (Schoemaker, 1995).

In line with Vecchiato et al. (2019), the respondents said that being agile is one of the most important characteristics of an organization that quickly needs to adapt and drive change. R7 and R8 mentioned that the uncertainties that are most dangerous to the firm are the ones that they are not aware of, much in line with what Schoemaker (1995) explained as the third and most important consideration of our knowledge in regard to scenario planning – things we don't know we don't know. Naturally, mitigating the risks of repeating the same mistakes is desirable and can, according to R8, be done by writing a white book that lists the steps that have been taken, and what went wrong throughout the process. This respondent said that they

try to be a learning organization, which in the literature emphasizes a more agile approach, where flexibility and the ability to quickly adapt are key (Vecchiato et al., 2019).

However, as managers' previous experiences, either through white books, previous failed or successful projects, or the agile approach, their views, expectations, and scenarios may be biased (Schoemaker, 1995). R3 argued that political correctness has become an issue and that the rationale behind decisions can be affected. R3 further argued that it is more important to take a decision, which may or may not be the right one than to search for the best option that may never come. Both statements align with what Brunsson (1982) discusses in decision theory – rationality and action.

The respondents' views and usage of scenario planning are in many ways similar to what the literature argues to be the reasons for actors in the industry to approach the technique. R4 stated that uncertainties make them more risk-averse and that questions regarding exposure to regions and resources are brought to the table (Vecchiato et al., 2019).

## 6.0 Conclusion

*The final chapter will present the most important findings of this thesis. First, the authors aim to answer the research questions posed. Then, some recommendations on how to incorporate sustainability in the decision-making. Lastly, the authors will present their recommendations for future research.*

### 6.1 Answering the research questions

This thesis aimed to investigate how sustainability has influenced the Swedish automotive industry by exploring how different functions in the industry have incorporated sustainability criteria in their decision-making process.

To answer the first research question: ***How does the Swedish automotive industry include sustainability criteria in its decision-making?*** The Swedish automotive industry includes sustainability criteria to a great extent, especially environmental criteria. Their sustainability goals have led them to include the criterion across all functions and it is included in every decision-making process. The companies studied have adopted a strategic approach that pushes them to include the environmental sustainability criterion and economic criterion, and it was found that these criteria are highly prioritized in their decision-making process. In the innovation function, the environmental sustainability criterion is prioritized over the economic criterion while in the finance function, the most important was the economic criterion. In the other functions, it was difficult to determine which of the two was prioritized but it can be concluded that they were the most important criteria along with the safety criterion. The social sustainability criterion, however, did not receive as much attention as the economic and environmental criteria. This could be because it seemed to be the focus of functions not studied in this thesis (mainly the procurement function), it was viewed more as an overarching criterion that is set by management and then it is assumed that it is followed, or that it is not an area of focus for the functions studied.

Although some elements of their decision-making methods were similar to an MCDA, the study cannot conclude that such a method was used. Instead, it was found that their



decision-making methods differed across functions, and the criteria they include will depend on the goal of the decision. It can be concluded that all the functions except for the finance function use methods where they prioritize criteria based on the importance of that function. With more and more environmental criteria introduced, the use of an MCDA could ease the process for companies to prioritize sustainability criteria.

Then there is the second research question: *What are the most prominent challenges when considering sustainability in the decision-making process?* The challenges were found to be similar across functions. The study found that the most prominent challenge was measuring and collecting the qualitative data connected to the criteria. This is an important aspect of prioritizing because companies want to be able to measure key criteria to see the effects of actions. The lack of knowledge about the potential impact may lead to the sustainability criterion being prioritized less. The study also found that if the companies want to reach their goals, they need to transform their value chain, from supplier to end consumer which was seen as a major challenge, partly because of the limited insight they have on their suppliers.

Lastly, to answer the third research question: *To what extent do decision-makers in the Swedish automotive industry use corporate foresight to prepare for future sustainability challenges and opportunities?* Scenario planning was proven to be a useful tool for the respondents in their goal to enable better and more informed decisions. However, there were some notable differences in the way it was used, and to which extent. The study found that it was those within management that used it to the greatest extent, as those within finance and risk used it in a shorter perspective to identify best and worst or case scenarios. Although it differed, it can be argued that it was used to mitigate risk and as a tool for continuous follow-ups on trends and uncertainties. Furthermore, as there was no standardized way of constructing scenarios nor explained to be cross-functionally developed, it can be argued that reconciling the functions' scenarios in the future could be problematic.

## **6.2 Implications**

With the analysis in Chapter 5 and the conclusion above, this thesis offers a comprehensive view of how sustainability is included in the Swedish automotive industry. In the following sub-chapter some of the practical implications derived from this thesis are presented.

The first implication of this thesis concerns the uncertainty and difficulty the participants had in some sustainability measurements. This difficulty was highlighted by most of the participants during the semi-structured interviews, and it is thus important to combat it. This thesis recommends that companies integrate fuzzy numbers. It will allow them to capture the imprecision and ambiguity of qualitative criteria. This may lead to sustainability criteria being more measurable, thus it easier to track and incorporate into the decision-making. The utilization of fuzzy numbers may result in a more objective evaluation of alternatives and support the automotive companies' pursuit of their sustainability goals.

The second implication concerns social sustainability. It can be argued that the companies in this study should give more weight to social sustainability in decision-making. This thesis found that economic and environmental sustainability are prioritized but according to Elkington (1997), you must consider all three dimensions to be considered sustainable. By giving social sustainability more weight, companies may attract more human capital, enhance their brand image, boost morale, and possibly benefit financially as well. By using fuzzy numbers and giving the criterion more weight, they can prioritize social sustainability in the same way they prioritize the other dimensions; it can make companies truly “sustainable” according to the triple bottom line.

## **6.3 Future research**

The authors suggest that future research focuses on three areas that this research lacked insight into, and due to its scope, could not be considered to the desired extent. First, as this thesis focused on multiple companies and multiple functions, the findings may be too general for practical consideration. Therefore, future research could be done in a more specific setting using a single case study design instead, as this may generate more relevant findings for

companies. By exploring this industry through a single case, more unique findings could be identified and the recommendations more tailored.

Second, as the result of this study suggests, how scenario planning was used, and to which extent, differed. Hence, future research could focus on how futuristic approaches such as scenario planning can enable decision-makers to better navigate in changing environments, and investigate if there are any benefits to implementing scenario planning in each function.

Lastly, to the authors' knowledge, not enough research has focused on how fuzzy numbers can be used in decision-making. By researching how fuzzy numbers can be applied in practice in the automotive industry difficulties in quantifying qualitative data, organizations may receive valuable insights into how they can integrate it.

## References

- Agarwal, P., Sahai, M., Mishra, V., Bag, M., & Singh, V. (2014). Supplier Selection in Dynamic Environment using Analytic Hierarchy Process. *International Journal of Information Engineering & Electronic Business*, 6(4).
- Alhaddi, H. (2015). Triple bottom line and sustainability: A literature review. *Business and Management Studies*, 1(2), 6-10.
- Ali, B. A., Sapuan, S. M., Zainudin, E. S., & Othman, M. (2015). Implementation of the expert decision system for environmental assessment in composite materials selection for automotive components. *Journal of Cleaner Production*, 107, 557-567.
- Bell, E., Bryman, A., & Harley, B. (2019). *Business research methods (5th edition)*.
- Bergbaum, A., Edwards, F., & Parker, N. (2021). *It's time for vehicle manufacturers to shift gears on scope3 emissions*. Alixpartners.  
[https://insights.alixpartners.com/post/102h99m/its-time-for-vehicle-manufacturers-to-shift-gears-on-scope-3-emissions#&utm\\_source=mondaq&utm\\_medium=syndication&utm\\_term=Environment&utm\\_content=articleoriginal&utm\\_campaign=article](https://insights.alixpartners.com/post/102h99m/its-time-for-vehicle-manufacturers-to-shift-gears-on-scope-3-emissions#&utm_source=mondaq&utm_medium=syndication&utm_term=Environment&utm_content=articleoriginal&utm_campaign=article)
- Brunsson, N. (1982). *The irrationality of action and rationality: Decisions, ideologies and organizational actions*. *Journal of management studies*. Vol 19 No. 1, 29-44.
- Calabrese, A., Costa, R., Levialdi, N., & Menichini, T. (2019). Integrating sustainability into strategic decision-making: A fuzzy AHP method for the selection of relevant sustainability issues. *Technological Forecasting and Social Change*, 139, 155-168.
- Campbell, R. (2022) *Car pollution facts: from production to disposal, what impact do our cars have on the planet?*  
<https://www.autoexpress.co.uk/sustainability/358628/car-pollution-production-disposal-what-impact-do-our-cars-have-planet>

Chan, F. T., Kumar, N., Tiwari, M. K., Lau, H. C., & Choy, K. (2008). Global supplier selection: a fuzzy-AHP approach. *International Journal of production research*, 46(14), 3825-3857.

Chang, D. Y. (1996). Applications of the extent analysis method on fuzzy AHP. *European journal of operational research*, 95(3), 649-655.

Cinelli, M., Coles, S. R., & Kirwan, K. (2014). Analysis of the potentials of multi criteria decision analysis methods to conduct sustainability assessment. *Ecological indicators*, 46, 138-148.

Cint (2022, June 29). *What Is a Questionnaire and How Is It Used in Research?* Retrieved from <https://www.cint.com/blog/what-is-a-questionnaire-and-how-is-it-used-in-research>

Collis, J., & Hussey, R. (2003). *Business research: A practical guide for undergraduate and postgraduate students*.

Daugaard, D. (2020) Emerging new themes in environmental, social and governance investing: a systematic literature review. *Accounting and Finance*. *Accounting & Finance* 60 (2020) 1501–1530

Destatte, P. (2010) *Foresight: A major tool in tackling sustainable development*. *Technological Forecasting and Social Change*, Volume 77, Issue 9, 2010, Pages 1575-1587. ISSN 0040-1625. <https://doi.org/10.1016/j.techfore.2010.07.005>.

Dwirandra, AANB, & Astika, IBP (2020). *Impact of Environmental Uncertainty, Trust and Information Technology on User Behavior of Accounting Information Systems*. *The Journal of Asian Finance, Economics and Business* , 7 (12), 1215–1224. <https://doi.org/10.13106/JAFEB.2020.VOL7.NO12.1215>

Elkington, J. (1997). The triple bottom line. *Environmental management: Readings and cases*, 2, 49-66.

Finkbeiner, M., Inaba, A., Tan, R., Christiansen, K., & Klüppel, H. J. (2006). The new international standards for life cycle assessment: ISO 14040 and ISO 14044. *The international journal of life cycle assessment*, 11, 80-85.

Forman, E. H., & Gass, S. I. (2001). The analytic hierarchy process—an exposition. *Operations research*, 49(4), 469-486

Friede, G. Busch, T. Bassen, A. (2015) *ESG and financial performance: aggregated evidence from more than 2000 empirical studies*. <https://doi.org/10.1080/20430795.2015.1118917>

Ghadimi, P., Azadnia, A. H., Yusof, N. M., & Saman, M. Z. M. (2012). A weighted fuzzy approach for product sustainability assessment: a case study in the automotive industry. *Journal of Cleaner Production*, 33, 10-21.

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational research methods*, 16(1), 15-31.

Görener, A. (2012). Comparing AHP and ANP: an application of strategic decision making in a manufacturing company. *International Journal of Business and Social Science*, 3(11), 194-208.

Hack, B.N. (2011) *How deeply engaging stakeholders changes everything*. Forbes. <https://www.forbes.com/sites/85broads/2011/05/03/how-deeply-engaging-stakeholders-change-everything/?sh=1426d3876932>

Henisz, W. Koller, T. Nuttall, R. (2019) Five ways that ESG creates value <https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/five-ways>

-that-esg-creates-value

Hewitt, M. Ortmann, J. Rei, W. (2022) *Decision-based scenario clustering for decision making under uncertainty*. *Ann Oper Res* 315, 747–771 (2022).

<https://doi-org.ezproxy.ub.gu.se/10.1007/s10479-020-03843-x>

International Trade Administration. (2022) *SWEDEN ELECTRIC VEHICLES MARKET OVERVIEW*.

<https://www.trade.gov/market-intelligence/sweden-electric-vehicles-market-overview>

Jamali, D. (2006). Insights into triple bottom line integration from a learning organization perspective. *Business Process Management Journal*.

Kumar, S., & Vaidya, O. S. (2006). Analytic hierarchy process: An overview of applications. *European Journal of operational research*, 169(1), 1-29.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. sage.

Liu, Y., Eckert, C. M., & Earl, C. (2020). A review of fuzzy AHP methods for decision-making with subjective judgements. *Expert Systems with Applications*, 161, 113738.

Lynk & Co, (2023) <https://www.lynkco.com/sv-se>

Mardani, A., Jusoh, A., & Zavadskas, E. K. (2015). Fuzzy multiple criteria decision-making techniques and applications—Two decades review from 1994 to 2014. *Expert systems with Applications*, 42(8), 4126-4148.

Mathiyazhagan, K. Sengupta, S. Poovazhagan, L. (2018) *A decision making trial and evaluation laboratory approach to analyze the challenges to environmentally sustainable manufacturing in Indian automobile industry*. Sustainable Production and Consumption. Volume 16, 2018, Pages 58-67, ISSN 2352-5509. <https://doi.org/10.1016/j.spc.2018.05.007>.

Milliken, F. J. (1987). Three Types of Perceived Uncertainty about the Environment: State, Effect, and Response Uncertainty. *The Academy of Management Review*, 12(1), 133–143. <https://doi.org/10.2307/257999>

Mullor, J. R. Bernabeu, A. G. Santamaria, D. P. Ferrandiz, M. V. (2022) *Evaluating ESG Corporate performance using a new neutrosophic AHP-topsis based approach*. <https://doi.org/10.3846/tede.2022.17004>

Naturvårdsverket. (2023) *Sveriges utsläpp och upptag av växthusgaser*. <https://www.naturvardsverket.se/data-och-statistik/klimat/sveriges-utslapp-och-upptag-av-vaxthusgaser/>

Nordelöf, A., Messagie, M., Tillman, A. M., Ljunggren Söderman, M., & Van Mierlo, J. (2014). Environmental impacts of hybrid, plug-in hybrid, and battery electric vehicles—what can we learn from life cycle assessment?. *The International Journal of Life Cycle Assessment*, 19, 1866-1890.

O'Brien, F.A. (2004) *Scenario planning - Lessons for practice from teaching and learning*. *S.I. : Business Analytics and Operations Research*. [https://doi.org/10.1016/S0377-2217\(03\)00068-7](https://doi.org/10.1016/S0377-2217(03)00068-7)

OECD, 2016. *OECD Science, Technology and Innovation Outlook 2016*. OECD Publishing.

Oliveira, M., Fontes, D. B., & Pereira, M. T. R. (2013). Multicriteria decision making: A case study in the automobile industry.



Pailthorpe, B. C. (2017). Emergent design. *The international encyclopedia of communication research methods*, 1-2.

Patel, R. & Davidsson, B. (2003). *Forskningsmetodikens grunder –Att planera, genomföra och rapportera en undersökning*. Studentlitteratur: Lund.

Pohl, T. (2021) *How the automotive industry is driving toward a sustainable future*. Forbes.  
<https://www.forbes.com/sites/sap/2021/12/01/how-the-automotive-industry-is-driving-toward-a-sustainable-future/?sh=4f24ab828f1b->

Polestar. (2022). *Sustainability report*.  
[https://www.polestar.com/dato-assets/11286/1682594257-polestar\\_sustainabilityreport\\_2022\\_eng.pdf](https://www.polestar.com/dato-assets/11286/1682594257-polestar_sustainabilityreport_2022_eng.pdf)

Putra, M. A., Teh, K. C., Tan, J., & Choong, T. S. Y. (2020). Sustainability assessment of Indonesian cement manufacturing via integrated life cycle assessment and analytical hierarchy process method. *Environmental Science and Pollution Research*, 27, 29352-29360.

PWC, 2023. *Striking a balance between legislative requirements and consumer expectations*.  
<https://www.pwc.de/en/sustainability/sustainability-in-the-automotive-industry.html>

Ramirez, R. Churchhouse, S. Palermo, A. Hoffmann, J. (2017) *Using Scenario Planning to Reshape Strategy*. MIT Sloan Management Review.

Rogers, K., & Hudson, B. (2011). The triple bottom line. *OD practitioner*, 43(4), 4.

Saaty, T. L., & Peniwati, K. (2008). *Group decision making: drawing out and reconciling differences*. Pittsburgh, PA: RWS Publications.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students*. Pearson education.

SCB. (2022) *Sveriges export*.

<https://www.scb.se/hitta-statistik/sverige-i-siffror/samhallets-ekonomi/sveriges-export/>

Schoemaker, P. J. H. (1995) *Scenario planning: A tool for strategic thinking*. MIT Sloan Management Review 36.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for information*, 22(2), 63-75.

Slaper, T.F., & Hall, T.J. (2011). The Triple Bottom Line: What Is It and How Does It Work?

Sridhar, K., & Jones, G. (2013). The three fundamental criticisms of the Triple Bottom Line approach: An empirical study to link sustainability reports in companies based in the Asia-Pacific region and TBL shortcomings. *Asian Journal of Business Ethics*, 2, 91-111.

Statista. (2022) *Estimated worldwide motor vehicle production from 2000 to 2021*. Statista. <https://www.statista.com/statistics/262747/worldwide-automobile-production-since-2000/>

Steele, K., Carmel, Y., Cross, J., & Wilcox, C. (2009). Uses and misuses of multicriteria decision analysis (MCDA) in environmental decision making. *Risk Analysis: An International Journal*, 29(1), 26-33

Stoycheva, S., Marchese, D., Paul, C., Padoan, S., Juhmani, A. S., & Linkov, I. (2018). Multi-criteria decision analysis framework for sustainable manufacturing in automotive industry. *Journal of Cleaner Production*, 187, 257-272.

United States Environmental Protection Agency. (2022) *Sources of Greenhouse Gas Emissions*. <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>

Volvo Cars. (2022). *Annual and Sustainability report*.  
<https://vp272.alertir.com/afw/files/press/volvocar/202303076446-1.pdf>

Vecchiato, R. (2015) *Creating value through foresight: First mover advantages and strategic agility*. *Technological Forecasting and Social Change* Volume 101, December 2015, Pages 25-36. <https://doi.org/10.1016/j.techfore.2014.08.016>

Vecchiato, R. Favato, G. di Maddaloni, F. Do, H. (2019) *Foresight, cognition, and long-term performance: Insights from the automotive industry and opportunities for future research*. Wiley. <https://doi.org/10.1002/ffo2.25>

Yin, R. K. (2009). *Case study research: Design and methods*(Vol. 5). sage.

## Appendix 1

Theory	Questions	Smaller/Follow-up Questions
<b>Introductory Questions</b>	Can you tell us about your role at the company?	1) What are your responsibilities?
	How long have you been at your company?	
	What role do you have in the decision-making process?	
<b>TBL</b>	What are the main sustainability goals for your team/department?	
	How do you incorporate economic, social, and environmental factors in the decision-making process?	1) How do you ensure that it has been considered? 2) How do you balance sustainability and financial factors when making decisions?
	How has stakeholder engagement influenced your organization's approach to sustainability	1) Do you find that stakeholder engagement has influenced your commitment to sustainability?
<b>Scenario planning</b>	Do you use any tools/methods for the long-term strategy to ease the decision-making, and if so, which?	1) When planning for the long-term, do you use scenario planning? 2) and in what detail?
	Do you use long-term planning as a method for making more informed decisions?	If not, do you use any other method?

	What role does trends play in your scenario planning/long-term planning?	
	In what ways does uncertainty affect your long-term planning?	
	How do you incorporate future scenarios and potential risks related to sustainability into your decision-making process?	
<b>Decision-methods</b>	Do you use any specific method(s) when evaluating different alternatives? - and if yes, which?  alternatives = investment alt, supplier alt etc.	1) Is there any tool for the different steps in the process?
	Which criteria/dimensions do you use when evaluating different alternatives?	1) Do you use both quantitative and qualitative criteria? 2) Which criteria/dimensions are prioritized?
	How do you evaluate factors that are difficult to measure? e.g., certain environmental/social factors that can be hard to transform into hard data	
	What challenges or barriers do you encounter when trying to integrate sustainability into the process?	1) Is it because certain criteria are in conflict?

## Appendix 2

Illustration of the creation of the thematic analysis.

Respondents	Main Theme/Categories	Sub-theme/Subcategories
R1: ●●●●●●●● R2: ●●●●●●●● R3: ●●●●●●●●	<b>Criteria</b>	<ul style="list-style-type: none"> <li>● Environment issues as the main driver of change</li> <li>● Safety is uncompromisable</li> <li>● Economically sustainable</li> <li>● Social efforts</li> <li>● N/A</li> </ul>
R4: ●●●●●●●● R5: ●●●●●●●● R6: ●●●●●●●●	<b>Methods</b>	<ul style="list-style-type: none"> <li>● Long term planning/ Scenario planning for a sustainable future</li> <li>● Different decision making methods</li> <li>● Decision-scales (1-10; medium-to-low)</li> <li>● Business case for evaluation purposes</li> </ul>
R7: ●●●●●●●● R8: ●●●●●●●●	<b>Other factors</b>	<ul style="list-style-type: none"> <li>● Stakeholders'</li> <li>● Uncertainty as a reason for planning</li> <li>● Qualitative criteria as barriers</li> <li>● Legislation/regulation are important drivers</li> </ul>

